

**EPA Superfund
Record of Decision:**

**SALTVILLE WASTE DISPOSAL PONDS
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SALTVILLE WASTE DISPOSAL PONDS
SUPERFUND SITE
SALTVILLE, VIRGINIA

RECORD OF DECISION
OPERABLE UNIT 2
(POND 5 AND POND 6)

PREPARED BY
THE U.S. ENVIRONMENTAL PROTECTION AGENCY

SEPTEMBER 1995

RECORD OF DECISION
SALTVILLE WASTE DISPOSAL PONDS SUPERFUND SITE

TABLE OF CONTENTS

PART I - DECLARATION

1.0	SITE NAME AND LOCATION	1
2.0	STATEMENT OF BASIS AND PURPOSE	1
3.0	ASSESSMENT OF THE SITE	1
3.0	DESCRIPTION OF THE SELECTED REMEDY	1
5.0	STATUTORY DETERMINATIONS	2

PART II - DECISION SUMMARY

1.0	SITE NAME, LOCATION, AND DESCRIPTION	4
2.0	SITE HISTORY AND ENFORCEMENT ACTIVITIES	5
3.0	HIGHLIGHTS OF COMMUNITY PARTICIPATION	8
4.0	SCOPE AND ROLE OF RESPONSE ACTION	8
5.0	SUMMARY OF SITE CHARACTERISTICS	9
	5.1 Physical Features	
	5.2 Nature and Extent of Contamination in Ponds 5 and 6	
	16
6.0	SUMMARY OF SITE HUMAN HEALTH RISKS	19
	6.1 Data Collection and Evaluation	20
	6.2 Exposure Assessment	21
	6.3 Toxicity Assessment	21
	6.4 Human Health Effects	25
	6.5 Risk Characterization	25
7.0	DESCRIPTION OF ALTERNATIVES	27
	7.1 Pond 5 Alternatives	27
	7.2 Pond 6 Alternatives	33
8.0	SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES	36
	8.1 Overall Protection of Human Health and the	
	Environment	38
	8.2 Compliance with ARARs	39
	8.3 Long-Term Effectiveness and Permanence	41
	8.4 Reduction of Toxicity, Mobility, or Volume through	
	Treatment	41
	8.5 Short Term Effectiveness	42
	8.6 Implementability	43
	8.7 Cost	44
	8.8 State Acceptance	45
	8.9 Community Acceptance	45
9.0	SELECTED REMEDY AND PERFORMANCE STANDARDS	45
	9.1 Pond 5	46
	9.1.1 Multi-Layered Cap	47
	9.1.2 Ground water Interceptor System	47
	9.1.3 Pond 5 Treatment Facility	47
	9.2 Pond 6	49

9.2.1	Permeable Soil Cover	49
9.2.2	Decant Structure Discharge Neutralization....	50
9.2.3	Contingent Remedial Action: Cap and Vertical Barrier Wall	50
9.3	Common Elements	51
9.3.1	Long-term Monitoring	51
9.3.2	Site Maintenance	51
9.3.3	Institutional Controls	52
10.0	STATUTORY DETERMINATIONS	52
10.1	Protection of Human Health and the Environment	52
10.2	Compliance with Applicable or Relevant and Appropriate Requirements	53
10.3	Cost-Effectiveness	53
10.4	Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable	53
10.5	Preference for Treatment as a Principal Element	54
11.0	DOCUMENTATION OF SIGNIFICANT CHANGES	55

PART III - RESPONSIVENESS SUMMARY

A.	OVERVIEW	57
B.	COMMENTS RECEIVED DURING THE PUBLIC MEETING	57
C.	WRITTEN COMMENTS FROM OLIN CORPORATION	61
D.	WRITTEN COMMENTS FROM OTHER CITIZENS	66

LIST OF TABLES

Table 1 - Exposure Point Concentrations	20
Table 2 - Exposure Assessment Factors	22
Table 3 - Slope Factors and Reference Doses	24
Table 4 - Summary of Site Risks	27
Table 5 - Present Worth Costs	45

LIST OF FIGURES

Figure 1 - Site Location	4
Figure 2 - Geologic Map of Site Area	11
Figure 3 - Pond 5 Boring Locations	17

APPENDICES

Appendix A - Administrative Record Index
Appendix B - Glossary

RECORD OF DECISION
SALTVILLE WASTE DISPOSAL PONDS SUPERFUND SITE

PART I - DECLARATION

1.0 SITE NAME AND LOCATION

Saltville Waste Disposal Ponds Superfund Site
Operable Unit 2 (Pond 5 and Pond 6)
Saltville, Virginia

2.0 STATEMENT OF BASIS AND PURPOSE

This Record of Decision ("ROD") presents the final remedial action selected for Operable Unit 2 (Pond 5 and Pond 6) of the Saltville Waste Disposal Ponds Superfund Site ("Site"), located in Saltville, Virginia. This remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended ("CERCLA"), 42 U.S.C. §§ 9601 et seq., and the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300. This decision document explains the factual and legal basis for selecting the remedial action and is based on the Administrative Record for this Site. An index of documents included in the Administrative Record maybe found at Appendix A of the ROD.

Although the Virginia Department of Environmental Quality ("VDEQ") has commented on the selected remedy and such comments have been incorporated into the ROD, the Commonwealth has not concurred with this ROD.

3.0 ASSESSMENT OF THE SITE

Pursuant to duly delegated authority, I hereby determine, pursuant to Section 106 of CERCLA, 42 U.S.C. § 9606, that actual or threatened releases of hazardous substances from this Site, as discussed in Section 6.0 (Summary of Site Risks) of Part II of this ROD, if not addressed by implementing the remedial action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

4.0 DESCRIPTION OF THE SELECTED REMEDY

The selected remedy for the Pond 5 area consists of the following major components:

- ! Installation of a multi-layered cap over the entire Pond 5 area;
- ! Ground water interceptor system;
- ! Revision of the effluent discharge limit for the existing Pond 5 Treatment Facility to achieve the current Virginia surface water standard for mercury and any modification of the Pond 5 Treatment Facility necessary to achieve the revised discharge limit;

The selected remedy for Pond 6 and consists of the following components:

- ! A permeable soil cover over the entire Pond 6 area, approximately 40 to 45 acres, including the demolition debris burial area;
- ! A pH adjustment system to neutralize the discharge from the Pond 6 decant structure;

The selected remedy for Pond 6 includes the following contingent remedial action which shall be required if mercury contamination from the buried debris is demonstrated to be migrating toward the river through the ground water in Pond 6:

- ! Isolation of Former Chlorine Plant Site demolition debris buried in the eastern end of Pond by vertical barrier wall and a multi-layered cap over the two to

three acres where the debris is buried.

Elements common to the selected remedies for both Pond 5 and Pond 6 include:

- ! Institutional controls;
- ! Maintenance of the Site security and maintenance programs;
- ! Long-term monitoring.

5.0 STATUTORY DETERMINATION

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. The remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this Site, and, in the case of contaminated ground water collected at the Pond 5 decant structure, satisfies the statutory preference for remedies that employ treatment as a principal element in order to reduce toxicity, mobility, or volume. EPA also evaluated remedies that employ treatment to address the mercury-contaminated waste material at the Site, however, the large volume of such waste material precludes a remedy in which contaminants could be excavated and treated effectively.

Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review will be conducted within five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Thomas C. Voltaggio
Director
Hazardous Waste Management Division
Region III
Environmental Protection Agency

Date

RECORD OF DECISION
SALTVILLE WASTE DISPOSAL PONDS SUPERFUND SITE

PART II - DECISION SUMMARY

1.0 SITE NAME, LOCATION, AND DESCRIPTION

The Saltville Waste Disposal Ponds Superfund Site ("Site") is part of Olin Corporation's former Saltville facility located along the north bank of the North Fork of the Holston River ("river") between the towns of Saltville and Allison Gap, in western Smyth and eastern Washington Counties, Virginia (Figure 1). The river forms the southern border of the site and Virginia state Route 611 runs along the northern border at the foot of Little Mountain. The Site consists of the Former Chlorine Plant Site and two waste ponds, Ponds 5 and 6, and areas to which contamination has migrated, including the river. Pond 5 and its dikes cover an area of about 76 acres. Pond 6 is immediately west and downstream of Pond 5. Pond 6 and its dikes cover an area of about 45 acres. The Former Chlorine Plant Site is about 1/2 mile upstream of Pond 5 and has an area of about 4 acres.

Figure 1 - Site Location

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

From approximately 1895 to 1972, the Saltville facility was owned and used by Olin Corporation ("Olin") or its predecessors (Olin Mathieson Chemical Corporation, Mathieson Chemical Corporation and Mathieson Alkali Works) as the location for various chemical manufacturing operations. Mathieson Chemical Corporation constructed a mercury cell chlor-alkali plant (also referred to as the chlorine plant) in 1950. The plant produced chlorine gas and sodium hydroxide by passing brine, obtained by solution mining salt deposits in the area, between electrodes. The cathode used in this process contained mercury and leakage from the electrode is considered the source of mercury in the pond wastes. The electrical current passing through the brine caused the formation of chlorine gas at the anode through electrolytic oxidation. At the same time a sodium amalgam was formed at the cathode. The amalgam was passed into a decomposing tower where the sodium was separated by flushing the water from the sodium hydroxide. Some of the mercury was lost in the production process and was solubilized and passed into Pond 5 in the wastewater.

Pond 5 was operated from approximately 1925 to 1971 and Pond 6 was put into service in 1964. The ponds were primarily used for the containment of ammonia soda ash wastes. In 1951, Pond 5 began receiving mercury-contaminated wastewater from the mercury cell chlor-alkali plant. Pond 6 also shows evidence of receiving mercury-contaminated wastewater but not to the extent believed to be in Pond 5. The intent of the settling ponds was to allow wastewater to percolate into the pond solids and allow mercury to adsorb onto the fine, alkaline particles of the ammonia soda ash waste.

The dikes containing the ponds were constructed of rockfill cores (starter dikes) and built up with accumulations of slaker wastes. The slaker wastes were primarily composed of spent coke and roasted limestone waste. Surface water discharge from Pond 5 is controlled by a decant structure located at the southwest corner of the pond. The decant structure consists of a concrete riser and a pipe culvert which extends from the river through the bottom of the dike to the river. A similar decant structure exists for Pond 6 at its southeastern end. Since 1978, discharge from these structures have kept the water level in the ponds beneath the surface of the settled solids.

The Pond 5 dikes are approximately 100 feet high and the depth of settled solids varies from about 35 feet to 70 feet, with an average of about 63 feet. The Pond 6 dike are approximately 35 feet high and the depth of the solids varies from about 20 feet to 30 feet. Vegetation on the site is moderate and consists predominantly of weeds and grasses, brush, and some young trees with trunk diameters of 6 inches or less.

The chlorine plant began operations in 1951 and continued operations through 1972. In 1969, after Swedish scientists discovered that inorganic mercury discharges to natural waters caused adverse health and environmental effects due to methylation, the U.S. Army and Federal Water Pollution Control Authority began to limit mercury discharges to navigable waters by permits. In order to control discharge to the river, Olin redirected most mercury-contaminated wastewater from the chlorine plant to Pond 5.

The process and washdown wastewater was conveyed to the eastern end of Pond 5 separately from the ammonia

soda ash waste slurry. The wastewater was discharged on the surface of Pond 5 near the eastern edge and directed around the northern perimeter by berms built on the surface of the pond.

Pond 6 began operating in 1964 and was used to settle ammonia soda ash waste. Mercury contamination has been detected in Pond 6. Based on current knowledge of the chlorine plant operation, it is possible that the mercury-contaminated weak brine purge water from the chlorine plant may have been used to help slurry the ammonia soda ash waste generated from another process independent of the chlorine plant and pumped to Pond 6. Olin believes that Pond 6 may have been discharged into Pond 6 late in the operation of the chlorine plant. This would account for the mercury contamination in Pond 6.

After Olin shut down the Saltville facility in 1972, Olin began demolition activities of the chlorine plant. Some of the debris from the demolition of the plant was placed at the eastern edge of Pond 6. It was placed on the lower bench of the dike between Pond 5 and Pond 6. The debris consisted mostly of brick, concrete, and steel from the buildings at the former chlorine plant. No sampling of the debris was conducted prior to disposal. The debris was covered with locally-obtained soil. The demolition of the process equipment was completed in June 1973. Process mercury was removed from the equipment and shipped to Olin plants in Georgia and Alabama for re-use. The equipment was cleaned with wash water which was allowed to percolate into the soils at the Former Chlorine Plant Site. The process equipment was then buried in the easternmost end of Pond 6 and covered with clean fill.

Environmental studies of the Site began in conjunction with heightened concern about mercury discharges nationwide. An investigation of the plant site and adjacent flyer by Olin, the Commonwealth of Virginia, and local agencies during the late 1960's revealed mercury contamination at the Site including in the river. In 1970, as a result of mercury concentrations found in fish, both Virginia and Tennessee placed a ban on fishing in the river. Both bans were later modified (Tennessee's in 1972, Virginia's in 1974) to permit fishing on a catch and release basis.

In 1978, a Task Force was formed which included the Virginia State Water Control Board, Virginia Attorney General's Office, Tennessee and Virginia State Departments of Health, Tennessee Valley Authority, and EPA. The Task Force required Olin to conduct studies to identify the sources of mercury-contamination at the Saltville facility, and negotiated cleanup measures with Olin to reduce mercury input to the river.

Under a special order issued in 1982 by the Virginia State Water Control Board, Olin dredged contaminated sediments from a 1000 foot section of the river adjacent to the Former Chlorine Plant Site. The excavated sediments were placed on the Former Chlorine Plant Site and covered with 2 feet of clay and 6 inches of topsoil. This project was supplemented by the construction of a diversion ditch around the western, upstream side of Pond 5 (the Western Diversion Ditch) to reduce surface water flow onto the pond.

EPA proposed the Saltville Waste Disposal Ponds Site for inclusion on the National Priorities List ("NPL") in December 1982, and placed the Site on the NPL on September 8, 1983, 48 Fed. Reg. 40658. In July 1986 and August 1986, EPA conducted a risk assessment and feasibility study ("FS"), respectively. These reports were based on existing data and available information supplied by the Saltville Task Force and Olin. EPA did not perform a remedial investigation ("RI") at this Site, because of the available data and continuing sampling effort being conducted under the 1982 special order between Olin and the Virginia State Water Control Board. EPA decided to conduct a risk assessment based on all available data to determine if data gaps existed. Several data gaps were identified in the 1986 risk assessment. The 1986 FS developed alternatives based on the available data; however, more data was deemed necessary to develop a final cleanup. Based on the 1986 risk assessment and FS, EPA issued a Record of Decision ("ROD") on June 30, 1987. An interim remedial alternative with additional RI/FS studies was selected to remediate the immediate threat. Olin entered into a Consent Decree with EPA in 1988, agreeing to implement the interim remedial actions and to conduct the additional RI/FS studies.

In June 1989, Olin submitted the Work Plan for the additional RI/FS studies. Field activities for the RI/FS began in December 1988. EPA agreed to permit Olin to begin installation of ground water wells prior to final Work Plan approval. The final RI and risk assessment reports were accepted by EPA in December 1994, and the final FS was accepted by EPA in January 1995.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

Pursuant to Section 113(k)(2)(B)(i)-(v) of CERCLA, 42 U.S.C. § 113(k)(2)(B)(i)-(v), the RI/FS reports and the Proposed Plan for Operable Unit 2 of the Site were released to the public for comment on January 18, 1995. These documents were made available to the public in the Administrative Record located in the EPA Docket Room in EPA's Region III Philadelphia Office, and the Smyth-Bland Regional Library, Saltville Branch,

Saltville, Virginia. The notice of availability of these documents was published in the Smyth County News and Saltville News Messenger on January 18, 1995 and January 20, 1995, respectively.

A public comment period on the documents was held from January 18, 1995 to February 17, 1995. EPA received a request for a 60-day extension to the public comment period on February 2, 1995. As a result, EPA granted a 31-day extension whereby the closing date for the public comment period was extended to March 20, 1995. EPA held a public meeting in Saltville on February 1, 1995. In addition, informal public availability sessions were conducted by EPA at the Saltville Town Hall on March 15-16, 1995. At the meeting and the availability sessions, representatives from EPA answered questions about conditions at the Site and the remedial alternatives under consideration. Responses to the comments received during the public comment period are included in the Responsiveness Summary, which is a part of this ROD

4.0 SCOPE AND ROLE OF RESPONSE ACTION

As with many Superfund sites, the problems at the Saltville Waste Disposal Ponds Site are complex. At the time EPA issued the Proposed Plan in January 1995, EPA had organized the work at the Site into the following Operable Units ("OUs"):

- ! interim remedial actions;
- ! Site ground water, Ponds 5 & 6, and the Former Chlorine Plant Site; and
- ! impact to the river.

EPA selected the interim remedial actions in a ROD issued on June 30, 1987. These actions involved the design and construction of a surface water diversion ditch around the eastern side of Pond 5, as well as a treatment plant to handle ground water collected at Pond 5. Both of these interim remedial actions are complete and operational. The interim remedial actions addressed the most immediate needs of the overall cleanup process at the Site (i.e., to divert the majority of the surface water from coming in contact with the mercury-contaminated waste in Pond 5 and treat the ground water from Pond 5 discharging to the river via the Pond 5 decant structure).

The operable unit evaluated in the January 18, 1995 Proposed Plan addressed remediation of the source materials (process waste contained in Pond 5 and Pond 6 and the contaminated soils and sediment at the Former Chlorine Plant Site) and ground water. However, after considering the comments provided by the public on the Proposed Plan, EPA decided that this ROD will address only Pond 5 and Pond 6. The Former Chlorine Plant Site (including ground water beneath that area) will be addressed along with the impact of mercury contamination on the river as the final operable unit for the Site.

5.0 SUMMARY OF SITE CHARACTERISTICS

5.1 Physical Features

Surface Features and Resources. The topography of the Site area is rugged, lying within the Appalachian Valley and Ridge Physiographic Province of western Virginia. The surface features of the Site and surrounding area reflect the local geologic conditions. The North Fork of the Holston River in Smyth and Washington Counties has incised its channel into soft shales and siltstones. More competent rock forms the ridges to the north and south of the Site.

The Site includes two drained settling ponds impounded by steep dikes along the river. The dikes are approximately 35 and 100 feet high for Ponds 6 and 5, respectively. The surfaces of the ponds are relatively level and support a moderate growth of grasses. Pond 5 covers approximately 76 acres. It is one and three quarters miles long and one quarter mile wide. Pond 6 covers approximately 45 acres. Pond 6 is three quarter miles long and slightly less than one quarter mile wide.

The Pond 5 decant structure was constructed in the southwest corner of the pond at the time the pond was built. It was designed to control the water elevation within Pond 5 and to drain excess water to the river as the process wastes settled. A similar decant structure exists at Pond 6 and extends to the base of Pond 6. The decant structure of Pond 6 is located in the southeast section of Pond 6.

A diversion ditch was installed around the western perimeter of Pond 5 in 1982-1983 to divert the majority of surface water flowing onto the pond from Little Mountain. An Eastern Diversion Ditch around the eastern

portion of Pond 5 was constructed in 1991 as part of the Operable Unit 1 Interim Remedial Actions. The Eastern Diversion Ditch collects the remaining surface water flow from Little Mountain A high, chain link fence bounds Ponds 5 and 6 on three sides, but not on the side bordering the river.

The Former Chlorine Plant Site is located approximately one-half mile upstream and east of the ponds and covert approximately four acres. Two feet of clay and six inches of topsoil were installed over the Former Chlorine Plant Site area pursuant to a special order issued in 1982 by the Virginia State Water Control Board. Rip-rap was installed along the river bank adjacent to the Former Chlorine Plant Site following the 1982 remedial activities to prevent river bank erosion.

Geology. The Site lies on the river flood plain within the river valley drainage basin and is located between Little Mountain to the north and the limestone bluffs south of the Site and river. Geology of the Saltville area is structurally complex with Mississippian sedimentary rock formations and the older Cambrian sedimentary rock formations mapped as occurring in the Pond 5, Pond 6 and Former Chlorine Plant Site area. The Greendale Syncline and the Saltville thrust fault are the two major structural features which occur in the study area. The axis of the Greendale Syncline is mapped as occurring 2000 feet southeast of the river and trends northeast. The southeastern limb of the syncline (i.e., southeast of the synclinal axis) is overturned and the syncline is recumbent. (See RI Figure 4-10). The Site, however, is located on the mapped northwestern limb of the syncline. At the Site, the bedding trend is reported as approximately North 60 degrees East with a dip approximately 30 degrees to the southeast. The Saltville Thrust Fault which is the other major structural feature is located over a mile southeast of the river and has thrust the older Cambrian sedimentary formations onto the younger Mississippian formations. The tectonic forces that formed these features were largely compressional and are responsible for formation of the northeasterly trending valleys and ridges of the Appalachian Mountain Valley and Ridge Physiographic Province. A fracture trace analysis of aerial photographs suggests that there are strong lineations (potential fractures) in directions parallel to bedding strike and dip as well as North 65 degrees West (See RI Figure 4-3).

At the Site, overlying weathered bedrock are alluvial deposits upon which the dike, pond and Former Chlorine Plant Site fill were placed. The alluvium consists of sand, gravel, silt, and clay river sediment and flood plain deposits. Colluvium, which consists of sandy silts and silty sands with varying degree of coarse sand to fine gravel-sized sandstone and siltstone fragments, was encountered on the slope of Little Mountain. The bedrock stratigraphy associated with the Greendale Syncline and pertinent to the Site consists of six formations of Mississippian age. The formations were formed as a result of a marine depositional environment. Figure 2 is a geologic map which depicts the Site.

North-northwest of the Site the Price Formation is mapped as outcropping at the southern slopes of Little Mountain along State Route 611. The Price Formation is described as medium to thinly bedded greenish gray quartzose sandstones. The upper 40 feet is interbedded with thin coal lamination and several thin coal beds. The upper contact with the overlying MacCrady Formation forms the knobs between swales along State Route 611 up to the western end of Pond 5.

The MacCrady Formation was subdivided into three distinct members based upon occurrence and economic interest. The three members consist of a lower sandstone-siltstone member, a middle dolomitic member, and an upper plastic shale member. The thickness of the formation varies greatly in the short distance between Allison Gap and Saltville. This thickness variation has been attributed to the deformation of the formation during the folding of the bedrock which has thickened the plastic shale member in the recumbent southeastern limb of the Greendale Syncline. The thickness of the plastic shale member is approximately 30 feet at Allison Gap and around 1500 feet in Saltville, as observed in the exploratory boreholes and brine wells less than a mile to the south-southeast of the Site. Cooper (1966) observed that the salt-bearing portions of the formation comprised a tectonic breccia with a characteristic salmon-red color due to dissemination of red to maroon plastic shales within the salt matrix. Evaporite occurrence in the plastic shale member on the northwestern limb (i.e., at the Site) of the Greendale Syncline is rare and discontinuous if present. The Little Valley Formation overlies the MacCrady Formation.

The Little Valley Formation is mapped as immediately underlying the majority of the Site. The formation is comprised of slightly to heavily weathered calcareous shales, sandstones and siltstones, intercalated with limestone and dolostone beds. The formation generally weathers to a yellowish-gray to brown color. Crinoid columnals, brachiopods, corals and bryozoan fossil fragments can be found in highly weathered shales exposed on the Site and west of Pond 6.

The Hillsdale Limestone Formation overlies the Little Valley Formation and at the lower contact it consists of a black cherty limestone overlain with a black fossiliferous limestone. This formation is mapped at the southernmost portion of the Site in the river at the roadway bridge adjacent to the Former Chlorine Plant Site and has a reported overall thickness in the Greendale Syncline of approximately 250 feet. The Ste. Genevieve Formation immediately overlies the Hillsdale Limestone Formation.

The higher elevations of the sinkhole knobs and pasture land across the river from the Pond 5 dike are formed by limestone members of the Ste. Genevieve Formation. At the higher elevations, outcrops are of slightly to moderately weathered, medium to thickly bedded dark gray, weathering to light gray limestone. This formation is reported to have crinoid fossils.

Some solution features have been noted along the axis of the Greendale Synclinal axis in this formation.

Site surface mapping and subsurface drilling activities identified the presence of an upper weathered and fractured bedrock zone extending to depths of 20 feet. Along the flank of Little Mountain and the northern Pond 5 and Pond 6 margins, some sliding of rock blocks along bedding planes has occurred where the river in its older channel (under Pond 5) undercut the dipping rock strata that form the lower slopes of Little Mountain.

The North Fork of the Holston River in Smyth and Washington Counties has incised its channel into shales and siltstones of the MacCrady and Little Valley Formations. These rock types are significantly easier to erode than the hard sandstones and limestones of the Price and Lower Little Valley/Hillsdale Limestone Formations that form the ridges to the north and south of the Site. Significantly, the soft shales and siltstones also weather to form clay and silt residual soils which are more impervious to ground water seepage. This may explain the success of the waste ponds in impounding water during the operation of Olin's plant.

Soils. Beneath the waste in Ponds 5 and 6 and the Former Chlorine Plant Site, alluvial deposits of sand, gravel, and silt are found within the old river flood plain. Residual soil and fractured bedrock are found overlying competent rock strata. The waste within the ponds is up to 70 feet thick and its geotechnical behavior and characteristics are similar to those of a normally consolidated to slightly overconsolidated clay. A pronounced fracture system is visible on the pond surfaces. The fracture system formed initially due to consolidation of the waste during placement and became more pronounced following rapid draining of the ponds in 1978. The fracture system continues to be visible because the fractures are developing as the process of consolidation continues. The major waste fractures in Pond 5 trend from the swales along Little Mountain, toward the decant structure at the southwest edge of the pond and along the west, north and east edges of the pond where settlements have been pronounced.

Hydrogeology. The focus of the field hydrogeologic investigations in the RI was the Pond 5 area and the eastern and southeastern margin of Pond 6. The Former Chlorine Plant Site was the subject of two previous hydrogeologic studies conducted in 1976 and 1982. The 1976 study was completed following demolition and removal of the chlorine plant equipment and the 1982 study was completed prior to encapsulation of sediments removed from the river and capping of the Former Chlorine Plant Site. The site hydrogeologic conditions have been grouped into categories of the Ponds 5 and 6 hydrogeology, the bedrock hydrogeology, and the Former Chlorine Plant Site.

Overall shallow ground water flow within the ammonia soda ash waste and the underlying alluvium is toward the south from Little Mountain to the river. Discharge from pond 5 occurs principally through the decant structure (which is pumped to the Pond 5 treatment plant), and to a lesser extent as seepage through the dike just above the upstream shale blanket covering the rockfill core of the dike. A highly fractured area of waste in the west-central portion of Pond 5 appears to act as a ground water sink, diverting much of the flow in the pond toward the decant structure located in the dike at the southwestern margin of Pond 5.

The deep portions of the bedrock underlying the Site may be subdivided into a series of hydrostratigraphic units based primarily upon detailed descriptions of bedrock lithology, fracture frequency and orientation and overall geologic structure. The RI focused upon the upper shallow bedrock zone and the interaction between this portion of the flow system and the Pond 5 flow regime.

The upper shallow bedrock is more highly weathered and fractured than the deep bedrock and may be distinguished from the deep bedrock by its structural characteristics and permeability contrast. The upper-most fractured bedrock zone is approximately 15 to 20 feet thick and extends across the base of Pond 5 immediately below the alluvium. Evidence from the hydrogeologic investigation indicates that the upper

weathered bedrock zone behaves as an integrated flow system. In general, hydraulic conductivity values appear to be greater in the upper portions of the bedrock where fracture distribution, frequency, and weathering are most prevalent.

Ground water flow in the highly weathered upper bedrock is generally toward the south from Little Mountain to the river. Little Mountain likely serves as the principal mechanism of recharge to the shallow bedrock, and the river as the main area of discharge. The ground water sink created by the fracture network in the Pond 5 fill near the decant structure seems to affect the flow of ground water in the upper bedrock flow system.

Ground water flow occurs at the Former Chlorine Plant Site in the fill/alluvium and bedrock underlying the area. Flow in the deeper bedrock is probably confined to individual rock units (i.e., individual beds of sandstone/siltstone or limestone) and along the principal hydraulic conductivity parallel to bedding strike. The shortest and most preferential ground water path is through the alluvium/fill beneath the Former Chlorine Plant Site to the river. Discharge of deep bedrock ground water is most likely along bedding strike to the river upstream of the Former Chlorine Plant Site or to Robertson Branch Creek.

The geometric mean of hydraulic conductivity of the upper bedrock aquifer through variable head tests (commonly referred to as slug testing) was estimated as 2.1×10^{-5} cm/sec. For the deeper bedrock the geometric mean of hydraulic conductivity was estimated as 3.4×10^{-6} cm/sec. Pressure packer testing was also performed and the geometric mean of hydraulic conductivity of the upper bedrock and deeper bedrock was estimated as 1.7×10^{-4} cm/sec and 5.2×10^{-5} cm/sec, respectively. Overall, the distribution of hydraulic conductivity values in the bedrock, both by area and with depth, suggest a high degree of heterogeneity throughout the bedrock flow system. The estimated average linear velocity using an effective porosity of 1 percent would range from 0.23 ft/day up to 3.5 ft/day, and with an effective porosity of 10 percent would range from 0.023 ft/day up to 0.35 ft/day.

The reported hydraulic conductivity for the alluvium and ammonia soda ash waste from rising head slug test results in the RI was 5.9×10^{-4} cm/sec and 6.2×10^{-7} cm/sec, respectively. In general, it is anticipated that the pond fill and ammonia soda ash waste possess highly variable hydraulic properties, owing to the irregular size and distribution of fractures and the heterogeneous nature of the fill and waste. Fractures in the ammonia soda ash waste have been observed to collapse and at other times to open at the pond surfaces most likely as a result of surface water flow, changing moisture content, and the response of the relatively weak pond material to consolidation and erosion.

Site Drainage. Within the Pond 5 sub-watershed, five swales on the upgradient ridge of Little Mountain conduct flow downgradient to the river, passing beneath State Route 611 and Pond 5 along the way. Currently, water flowing in the western four of the five swales within the sub-watershed is conveyed through culverts beneath the highway, downhill into energy dissipators, and then into the Western Diversion Ditch that has been constructed along and just above the northern margin of the Pond 5. The Western Diversion Ditch discharges downstream of the Pond 5 decant structure outlet. Water flowing in the eastern-most swale is diverted around the east end of Pond 5 through the recently constructed Eastern Diversion Ditch. The outlet of the ditches is the North Fork of the Holston River. The peak discharge of high intensity storm runoff from the ditches bypasses the Pond 5 system, and is effectively removed from the sub-watershed.

Like Pond 5, Pond 6 also lies on the valley floor on the north bank of the river, against the flank of Little Mountain to the north. The Pond 6 dike, separating the pond from the river, is similar in construction and composition to the Pond 5 dike. Adjacent to Pond 6, the river is flowing down strike on bedrock in a confined channel defined by a weak zone in the bedrock formation. Pond 6 is immediately downstream and to the west of Pond 5. Little Mountain to the north of Pond 6 can be characterized as having identical hydrologic properties as the section of the mountain to the north of Pond 5. The swales convey water down the mountain, under State Route 611 through culverts, and through the Pond 6 system to the river.

Unlike the Pond 5 system, flowing surface water in the swales cross a wide, flat area immediately adjacent to the north side of Pond 6. This flat area serves as a natural energy dissipator, reducing the velocity of the flows prior to their reaching the margin of the pond. Because of the low surface water velocities, no diversion structures, catch basins, or flow monitoring systems have been established within the Pond 6 sub-watershed.

The sub-watershed containing the Former Chlorine Plant Site is very small, containing little more than the plant site itself, as a result of drainage controls associated with State Route 634 and a road between the plant site and the Saltville wastewater treatment plant. Improvements to State Route 634 associated with

the new bridge across the river have included surface water ditches, catchment basins, french drains, and shallow soil grouting along the east side of the highway. As a result, the new roadway improvements have become a sub-watershed boundary for the northeast and east sides of the plant site, preventing all runoff from surrounding high ground to the north and east. A french drain to the north of the Site along Ice House Road accomplishes the same function on the north margin of the Site. The Former Chlorine Plant Site sub-watershed is bounded by Robertson Branch Creek to the west and by the river to the south.

5.2 Nature and Extent of Contamination in Ponds 5 and 6

An investigation to determine the extent of mercury in Pond 5 was conducted by Harza Engineering in 1979. The investigation involved drilling nineteen boreholes in the Pond 5 material at the locations shown on Figure 3. The results indicate that the upper 17 feet to 20 feet of the Pond 5 solids contain an estimated 93% of the total amount of mercury in Pond 5. The highest mercury concentrations were found in boreholes 14, 15, and 21 at the west end of the pond; boreholes 5, 10, and 13 at the northeast corner of the pond; and borehole 2 at the far east end of the pond. The upper 17.5 feet of these areas, with an area of about 29 acres, account for an estimated 69% of the total amount of mercury in the pond. The average mercury concentration in the waste for these areas is 28 mg/kg, while the average concentration in the upper layers of the rest of the pond is 7 mg/kg. Similar results were obtained during an investigation conducted by Olin and Law Engineering in 1981. Fourteen boreholes were drilled and soil samples extracted and analyzed for mercury concentration. Mercury concentrations noted in the 1981 investigation ranged from 0.1 mg/kg to 39.9 mg/kg. All of the samples taken within the upper 20 feet of the Pond 5 surface contained more than 3 mg/kg.

Waste samples were collected from Pond 6 in May and June of 1990, as reported in the 1994 RI (See RI Figure 7-10 for locations). The study involved hand augering 30 sample points in and around Pond 6. Samples were obtained at depth intervals from the surface to 1 foot, from 2 feet to 4 feet, from 8 feet to 10 feet, and at the deepest level available with the hand auger. The results show that mercury in Pond 6 is fairly evenly distributed across the area of the pond. In most of the boreholes, the highest concentrations were found in samples taken from the surface to a depth of one foot. The average concentration was approximately 20 mg/kg and the highest concentration was 78.3 mg/kg detected in borehole B-33 in the sample from the surface to 0.5 feet deep. Based on current knowledge of the chlorine plant operation, it is possible that weak brine purge discharge waters for the chlorine plant may have been used to help slurry waste the long distance from the process plant to Pond 6. This would explain both the relatively even distribution of mercury in Pond 6 solids and the lower mercury concentration relative to the Pond 5 solids. Soil samples collected between the Pond 6 dike and the river were found to have very low mercury concentrations ranging from 0.22 mg/kg to 0.75 mg/kg. These concentrations are likely the result of past waste handling procedures.

In addition to sampling for mercury concentrations, two waste material samples from Pond 5 and one from Pond 6 were analyzed in the 1994 RI for a full range of organic and inorganic parameters. The analyses indicated that the only constituents present at levels of potential concern were several volatile organic compounds. All three samples contained methylene chloride at low concentrations; however, the associated method blank also contained methylene chloride, indicating possible laboratory contamination of the samples. The two samples from Pond 5 also contained chloroform at 3 :g/kg (estimated) to less, with the detection limit at 8 :g/kg; acetone from non-detected to 41 :g/kg; and toluene reported as not-detected in one sample and estimated at 3 :g/kg in the other sample, which was below the detection limit of 8 :g/kg. The sample from Pond 6 also contained a low concentration of acetone (20 :g/kg).

Ground water within the Pond 5 and Pond 6 flow systems was collected from ten monitoring well clusters, resulting in a total of twenty monitoring wells being sampled (See RI Figure 7-12 for well locations) during the 1994 RI. The mercury concentrations for 34 out of 76 samples were less than the detection limit 0.2 :g/l, and results for 55 of the samples were less than 0.001 :g/l mercury. The monitoring well identified as MW-10S, located in the northeast corner of Pond 6, showed the highest concentration of mercury. The mercury concentrations in this well ranged from 13.4 :g/l to 106.7 :g/l. This particular well is located in fill containing demolition debris from the former chlorine plant. Because the debris is probably the source of mercury found in these samples, and because concentrations detected at the MW-10S well are much higher than at other wells, MW-10S analytical results are not considered representative of ground water conditions in and around Pond 6. Three wells near the Pond 6 decant structure (MW-8S, MW-9S, and MW-9D) exhibited elevated mercury concentrations in March 1992. Subsequent sampling of these wells in March 1993 did not show any detectable mercury levels.

Very low to non-detectable levels of total mercury in the monitoring wells (except for the anomalous results at well MW-10S) indicate that downward migration of mercury to the base of the ponds is intercepted by flow within the waste fractures/crevasses, the former river channel (in the case of Pond 5), or a layer of alluvial sediments in the former river flood plain. These levels of total mercury also indicate, based on the bedrock ground water sample results, that there does not appear to be migration of waste particles with mercury from the ponds to the bedrock underlying the ponds.

Results of laboratory analyses in ground water samples taken during the 1994 RI indicate that organic constituents are not present above levels of concern in the ground water and outfall discharge streams. Low concentrations of acetone, methylene chloride, chloroform, and toluene were detected in some of the samples.

One round of inorganic/metal analyses was performed on ground water samples from monitoring wells in and around Ponds 5 and 6 during the 1994 RI. These results indicate that while mercury is the primary constituent of concern at the Site, several other metals were detected in the ground water. While concentrations are below the level of concern for drinking water, the concentrations of arsenic, chromium, copper, manganese, lead, and selenium were above concentrations in the one available background well.

6.0 SUMMARY OF SITE HUMAN HEALTH RISKS

A Baseline Risk Assessment was prepared as part of the 1994 RI in order to identify and define possible existing and future human health risks associated with exposure to the chemicals present at the Site if no action were taken. The Baseline Risk Assessment provides the basis for taking action at the Site and indicates the exposure pathways that need to be addressed by the remedial action. The Baseline Risk Assessment conducted for the Site evaluates risk associated with Pond 5, Pond 6, the Former Chlorine Plant Site, and the North Fork of the Holston River. Only human health risks associated with Pond 5 and Pond 6 are presented here since Ponds 5 and 6 are the focus of this ROD.

6.1 Data Collection and Evaluation

The data collected and described in the previous section were evaluated for use in the Baseline Risk Assessment. This evaluation involves reviewing the quality of the data and determining which data are appropriate to use to quantitatively estimate the risks associated with Site soil, sediment, surface water, and ground water.

For estimating soil exposure, results of a November 1979 sampling program were also included to supplement more recent samples from Pond 5. The data were reviewed with regard to difference in mercury concentrations at different locations and exposure potential. Depending on the distribution of the data set, either the 95 percent upper confidence limit ("UCL") on the arithmetic mean, or the back-transformed 95 percent UCL on the arithmetic mean of log transformed data was used in the risk calculations. In some instances, however, the 95 percent UCL was found to exceed the maximum detected concentration. In these cases, the maximum detected concentration was used in the risk calculation. Table 1 summarizes the exposure point concentrations used in the Baseline Risk Assessment.

Table 1 - Exposure Point
Concentrations

Contaminants	Soil/Waste Ingestion/Dermal Contact (mg/kg)	
	Pond 5	Pond 6
Chloroform	3.00E-03[1]	2.00E-02
Acetone	4.10E-02	
Tolulene	3.00E-03	
Mercury (Inorganic)	1.64E+02	7.83E+01
Sodium	1.89E+03	1.19E+03

[1] Concentrations are presented using scientific notation. A value expressed as 1.0E-01 is equivalent to 0.01, otherwise expressed as 1.0 x 10⁻¹.

6.2 Exposure Assessment

There are three basic steps involved in an exposure assessment: 1) identifying the potentially exposed populations, both current and future; 2) determining the pathways by which these populations could be exposed; and 3) quantifying the exposure. Under current Site conditions, children (age 6-10) could be potentially exposed to the soil/waste in Pond 5 and Pond 6 by trespassing on the ponds and coming in contact with contaminated soil/waste. This exposure pathway also includes incidental ingestion of soil/waste that could occur by actions such as placing contaminated hands or objects in the mouth.

Potential future risks were evaluated based on the assumption that land use at Pond 5 and Pond 6 could change in the future. The potential future use was assumed to be either residential or industrial. Although industrial use is the most likely scenario, residential use was considered because residential development has occurred previously on other waste disposal ponds associated with the Site. The potentially exposed populations and pathways under these future use assumptions would include those described above along with the following:

- ! Adults and children living in residences on Pond 5 and Pond 6 and coming in contact with and incidentally ingesting the contaminated soil/waste (NOTE: Drinking contaminated ground water was not considered as a pathway for exposure because naturally occurring levels of salt present in the ground water (similar to seawater) render it undrinkable);
- ! Adults working at industrial facilities constructed on Pond 5 and Pond 6 and coming in contact with and incidentally ingesting contaminated soil.

In order to quantify the potential exposure associated with each pathway, assumptions must be made with respect to the various factors used in the calculations. Table 2 summarizes the values used in the Baseline Risk Assessment. These values represent reasonable maximum exposure ("RME") levels.

6.3 Toxicity Assessment

The purpose of the toxicity assessment is to weigh available evidence regarding the potential for particular contaminants to cause adverse effects in exposed individuals. Where possible, the assessment provides a quantitative estimate of the relationship between the extent of exposure to a contaminant and the increased likelihood and/or severity of adverse effects.

A toxicity assessment for contaminants found at a Superfund site is generally accomplished in two steps: 1) hazard identification; and 2) dose-response assessment. Hazard identification is the process of determining whether exposure to an agent can cause an increase in the incidence of a particular adverse health effect (e.g., cancer or birth defects) and whether the adverse health effect is likely to occur in humans. It involves characterizing the nature and strength of the evidence of causation.

Table 2 - Exposure Assessment Factors

Exposure Factors	Trespasser (age 6-10)		Resident		Industrial Worker
	Current	Future	Child	Adult	
INGESTION EXPOSURE PATHWAY					
Ingestion Rate:					
Soil	120 mg/day	120 mg/day	200 mg/day	100 mg/day	50 mg/day
Exposure Frequency:					
Soil (RME)	26 days/yr				
DERMAL CONTACT EXPOSURE PATHWAY					
Skin Surface Area					
Exposed:					
Soil	2,526 cm²	2,526 cm²	1,006 cm²	2,750 cm²	2,750 cm²
Skin Adherence					
Factor:					
Soil	1.0 mg/cm²	1.0 mg/cm²	1.0 mg/cm²	1.0 mg/cm²	1.0 mg/cm²
Exposure Duration:					
Soil	5 years	5 years	6 years	24 years	25 years
Exposure Frequency:					
Soil (RME)	26 days/yr	84 days/yr	350 days/yr	350 days/yr	250 days/yr
Exposure Assessment Constants					
Exposure Duration	5 years	5 years	6 years	24 years	25 years
Body Weight	27 kg	27 kg	15 kg	70 kg	70 kg
Averaging Time:					
Carcinogens	70 years	70 years	70 years	70 years	70 years
Noncarcinogens	5 years	5 years	6 years	24 years	25 years

Dose-response evaluation is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the contaminant administered or received and the incidence of adverse health effects in the administered population. From this quantitative dose-response relationship, toxicity values (e.g, reference doses and slope factors) are derived that can be used to estimate the incidence of or potential for adverse effects as a function of human exposure to the agent. These toxicity values are used in the risk characterization step to estimate the likelihood of adverse effects occurring in humans at different exposure levels. For the purpose of the Baseline Risk Assessment, contaminants were classified into two groups: potential carcinogens and noncarcinogens. The risks posed by these two types of compounds are assessed differently because noncarcinogens generally exhibit a threshold dose below which no adverse effects occur, while no such threshold has been proven to exist for carcinogens. As used here, the term carcinogen means any chemical for which there is sufficient evidence that exposure may result in continuing uncontrolled cell division (cancer) in humans and/or animals. conversely, the term noncarcinogen means any chemical for which the carcinogenic evidence is negative or insufficient.

Slope factors have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with-exposure to potentially carcinogenic contaminants of concern. Slope factors, which are expressed in units of (mg/kg-day)⁻¹, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the slope factor. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Slope factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). Slope factors used in the Baseline Risk Assessment for contaminants found at the site are presented in Table 3.

Reference doses ("RfDs") have been developed by EPA to indicate the potential for adverse health effects from exposure to contaminants of concern exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of contaminants of concern from human epidemiological studies or animal studies to which uncertainty factors have been applied account for the use of animal data to predict effects on humans. Reference doses used in the Baseline Risk Assessment for contaminants found at the Site are presented in Table 3.

Table 3 - Slope Factors and Reference Doses

Analyte	Slope Factors (mg/kg-day) ⁻¹			Reference Dose (mg/kg-day)	
	Oral	Dermal	Class	Oral	Dermal
Acetone	ND	ND	D	0.1	0.1
Chloroform	0.0061	0.0061	B2	0.01	0.01
Methylene chloride	0.0075	0.0075	B2	0.06	0.06
Tetrachloro-ethylene	0.052	0.052	B2	0.01	0.01
Toluene	ND	ND	D	0.2	0.2
Arsenic	1.75	1.79	A	0.0003	0.000294
Cobalt	ND	ND	D	0.18	ND
Copper	ND	ND	D	0.0371	ND
Lead	ND	ND	B2	ND	ND
Inorganic Mercury	ND	ND	D	0.0003	0.00006
Organic Mercury	ND	ND	D	0.0003	0.000285
Sodium	ND	ND	D	ND	ND
Thallium	ND	ND	D	0.00008	0.00008
Vanadium	ND	ND	D	0.007	0.00021

Key:

ND - Not determined

Class = EPA Weight-Of-Evidence Class for Carcinogenicity

- A Human Carcinogen - sufficient evidence from epidemiological studies to support a causal association between exposure and cancer
- B Probable Human Carcinogen
- B1 ! At least limited evidence of carcinogenicity to humans from epidemiological studies
- B2 ! Usually a combination of sufficient evidence of carcinogenicity in animals and inadequate evidence of carcinogenicity in humans
- C Possible Human Carcinogen - limited evidence of carcinogenicity in animals in the absence of human data
- D Not Classified - inadequate evidence of carcinogenicity in animals

6.4 Human Health Effects

The unacceptable risk levels at the Site are primarily associated with potential exposure to mercury. The general health effects of mercury are summarized below. Human exposure to inorganic mercury is mainly through inhalation or ingestion. The inhalation pathway was not evaluated quantitatively in the Baseline Risk Assessment because air sampling results at the Site showed very low mercury levels. Most dietary inorganic mercurials dissociate to divalent mercury in the gastrointestinal tract and are poorly absorbed. Occupational studies have demonstrated that chronic exposure to metallic mercury vapor via inhalation primarily affects the central nervous system and the kidneys. Non-specific effects associated with the lowest exposure levels ($<100 \text{ } \mu\text{g mercury}/\text{m}^3$) include insomnia, anxiety, and biochemical alterations. Exposures greater than $1 \text{ mg mercury}/\text{m}^3$ can result in memory loss, personality changes, body tremors, and damage to lung tissue. No effects have been observed from exposure to mercury vapor at air concentrations of approximately $1 \text{ } \mu\text{g mercury}/\text{m}^3$ or less. Effects on both the nervous system and the kidneys are usually reversible, particularly if the effects are mild. In its carcinogen weight-of-evidence categories, EPA places inorganic mercury in Group D, which includes compounds for which there is inadequate evidence for carcinogenicity in animals or humans (See Table 3).

Human exposure to Organic (usually methyl) mercury is mainly through ingestion. Methyl mercury compounds are known to be toxic via oral exposure, and prenatal and newborn infants are particularly susceptible. Subchronic methyl mercury poisoning occurred in humans eating contaminated fish from Minamata Bay, Japan, from 1953 to the 1960's. The median level of total mercury in fish in Minamata Bay was estimated to be about 11 mg/kg fresh weight. Methyl mercury poisoning also occurred from eating bread produced from seed grain dressed with methyl mercury fungicide. Nerve damage causing "pins and needles" sensations in the hands and feet occurred at an estimated body burden of 25 mg of methyl mercury. No confirmed positive report of methyl mercury carcinogenicity in humans has appeared to date, and animal experiments have generally yielded negative results.

6.5 Risk Characterization

The risk characterization process integrates the toxicity and exposure assessments into a quantitative expression of risk. For carcinogens, the exposure point concentrations and exposure factors discussed earlier are mathematically combined to generate a chronic daily intake value that is averaged over a lifetime (i.e., 70 years). This intake value is then multiplied by the toxicity value for the contaminant (i.e., the slope factor) to generate the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the contaminant. These probabilities are generally expressed in scientific notation (e.g., 1.0×10^{-6} , otherwise expressed as $1\text{E-}6$). An excess lifetime cancer risk of 1.0×10^{-6} indicates that, as a reasonable maximum estimate, an individual has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site. The generally acceptable excess cancer risk range, as defined by Section 300.430 (e) (2) (i) (A) (2) of the NCP, 40 C.F.R. § 300.430(e) (2) (i) (A) (2), is between 1.0×10^{-4} and 1.0×10^{-6} .

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period (i.e., the chronic daily intake) with the toxicity of the contaminant for a similar time period (i.e., the reference dose). The ratio of exposure to toxicity is called a hazard quotient A Hazard Index ("HI") is generated by adding the appropriate hazard quotients for contaminants to which a given population may reasonably be exposed. Any media with an HI greater than 1.0 has the potential to adversely affect health.

Under potential current use of the Site, the Baseline Risk Assessment estimates that children trespassing on Pond 5 or Pond 6 would not be exposed to unacceptable noncarcinogenic or carcinogenic risk from the soil/waste. Under potential future use of the Site, the Baseline Risk Assessment estimates that children trespassing on Pond 5 could be exposed to a noncarcinogenic risk level from mercury in the soil/waste that is at the threshold for adverse effects (HI of 1.0). Also, under the conditions assumed for potential future use of the Site, unacceptable noncarcinogenic risks from mercury could be experienced by any future children or adults living on Pond 5 (HIs of 9.0 and 2.0, respectively) and by children living on Pond 6 (HI of 4.0). With potential future industrial use, workers at an industrial facility on Pond 5 could be exposed to a noncarcinogenic risk level that is at the threshold for adverse effects (HI of 1.0). Workers at an industrial facility on Pond 6 would not be exposed to unacceptable noncarcinogenic risks. Under potential future use of the Site, the Baseline Risk Assessment estimates that there are no unacceptable carcinogenic risks posed for trespassers, residents or industrial workers.

Also, under potential future use of the Site, the Baseline Risk Assessment estimates that there are no

unacceptable non-carcinogenic risks posed for Pond 6 trespassers, adult residents on Pond 6 or industrial workers on Pond 6. The noncarcinogenic and carcinogenic risks associated with both potential current and future uses of the Site are summarized in Table 4.

Table 4 - Summary of Site Risks²

Exposed Population	Media	Current Use		Future Use	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Trespasser	Soil/Waste:				
	Pond 5	0.4	5 x 10 ⁻¹³	1.0	2 x 10 ⁻¹²
	Pond 6	0.2	NA	0.6	NA
Resident-Adult	Soil/Waste				
	Pond 5	--	--	2.0	3 x 10 ⁻¹¹
	Pond 6			0.9	NA
Resident-Child	Soil/Waste				
	Pond 5	--	--	9.0	3 x 10 ⁻¹¹
	Pond 6			4.0	NA
Worker	Soil/Waste				
	Pond 5	--	--	1.0	5 x 10 ⁻¹²
	Pond 6			0.5	NA
NA- Not Analyzed					

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or, the environment.

7.0 DESCRIPTION OF ALTERNATIVES

The FS Report discusses the alternatives evaluated for the Site and provides supporting information relating to the alternatives presented in this ROD. The alternatives included here are numbered to correspond with those found in the FS Report.

² Values in bold are risks that pose an unacceptable threat to human health.

7.1 Pond 5 Alternatives

The alternatives for Pond 5 are as follows:

!	Alternative	P5A:	No Action
!	Alternative	P5B:	Institutional Controls, Monitoring, and Site Maintenance
!	Alternative	P5C-1:	Pond 5 Treatment Facility Upgrade
!	Alternative	P5F:	Ground water Management and Multi-layered Cap with Synthetic Liner
!	Alternative	P5F-X:	Ground water Management and RCRA Cap with Pond 5 Treatment Facility Upgrade
!	Alternative	P5G-1:	Ground water Management, Surcharging, and Gapping with Dike and Pond Materials
!	Alternative	P5H:	Ground water Management, Surcharging, and Capping with Synthetic Liner
!	Alternative	P5I:	In-Situ Treatment, Stabilization/Chemical Fixation, and Permeable Cover
!	Alternative	P5J:	In-Situ Treatment, Stabilization/Solidification of Upper 20 Feet of Soil/Waste, and Permeable Cover
!	Alternative	P5J-1:	In-Situ Treatment, Stabilization/Solidification of Upper 20 Feet of Soil/Waste in Areas of Suspected Highest Mercury Concentration, Multi-layered Cap

Alternative P5A: No Action

Estimated Capital Costs ³ :	\$	0
Estimated Annual Operation and Maintenance ("O&M") Costs ⁴ :	\$	212,000
Estimated Present Worth Costs ⁵ :	\$	6,350,000
Estimated Implementation Time:		Immediate

The NCP requires that EPA consider a "No Action" alternative for every site to establish a baseline for comparison to alternatives that do require action. This "No Action" alternative assumes that the interim action required by the interim remedial action ROD issued on June 30, 1987, will be maintained, but that Site maintenance and monitoring programs which have been implemented will not continue.

³ Estimated Capital Costs represent the present worth of all capital costs.

⁴ Estimated Annual Operation and Maintenance Costs represent the total present worth of annual costs divided by the life of the project (30 years).

⁵ Estimated Present Worth Costs represent the present worth of all capital costs and the total present worth of O&M costs for a project life of 30 years. Present worth analysis is used to evaluate expenditures that occur over different time periods by discounting all

future costs to a common base year, in this case the current year. This allows the cost of remedial action alternatives to be compared on the basis of a single figure representing the amount of money that, if invested in the base year and disbursed as needed, would be sufficient to cover all costs associated with the remedial action over its planned life. The planned life of each alternative is 30 years.

Alternative P5B: Institutional Controls, Monitoring, and Site Maintenance

Estimated Capital Costs:	\$ 0
Estimated Annual O&M Costs:	\$ 279,000
Estimated Present Worth Costs:	\$8,382,000
Estimated Implementation Time:	Immediate

This alternative requires continuation of the existing maintenance programs and institutional controls. Components of this alternative include continuation of outfall monitoring, ground water monitoring, and maintenance of the Western and Eastern Diversion Ditches to intercept runoff from Little Mountain; maintenance of existing institutional controls (e.g. fencing, deed restrictions, and security measures); and operation and maintenance of the existing Pond 5 Treatment Facility.

Deed restrictions would restrict future land use and prohibit the installation of wells on Pond 5. Site security measures would be formalized and the existing fencing maintained.

The Site maintenance program would include regular, documented inspections of the overall Site, fencing, access roads, monitoring wells, and existing drainage controls/appurtenances. The developing vegetative growth on Pond 5 would be enhanced and maintained through top-seeding and fertilization.

Alternative P5C-1: Pond 5 Treatment Facility Upgrade

Estimated Capital Costs:	\$ 1,825,000
Estimated Annual O&M Costs:	\$ 285,000
Estimated Present Worth Costs:	\$10,376,000
Estimated Implementation Time:	3 years

This alternative includes the institutional controls, monitoring, and Site maintenance of Alternative P5B, and adds treatment of the point source effluent from the Pond 5 outfall to a level in compliance with the current Virginia surface water standards. The currently operating Pond 5 Treatment Facility designed in accordance with the interim remedial action ROD would be modified, if necessary, to meet the current Virginia surface water standards. For cost estimating purposes, EPA assumed that modifications to the Pond 5 Treatment Facility would be required to achieve the current Virginia surface water standards, however, the need for actual modifications would depend on the operational efficiency of the existing facility.

Alternative P5F: Ground water Management and Multi-layered Cap with Synthetic Liner

Estimated Capital Costs:	\$16,130,000 to \$19,055,000
Estimated Annual O&M Costs:	\$ 120,000
Estimated Present Worth Costs:	\$19,752,000 to \$22,650,000
Estimated Implementation Time:	3 years

This alternative includes the institutional controls, monitoring, and Site maintenance of Alternative P5B and adds: (1) a system to intercept, collect, and convey the shallow ground water flow from Little Mountain away from Pond 5; and (2) a multi-layered cap over the Pond 5 area. This alternative includes operation and maintenance of the existing Pond 5 Treatment Facility for four years during construction of the cap.

Alternative P5F-X6: Ground water Management and RCRA Cap with Pond 5 Treatment Facility Upgrade

Estimated Capital Costs:	\$26,876,000 to \$29,801,000
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Estimated Annual O&M Costs:	\$ 120,000
Estimated Present Worth Costs:	\$30,471,000 to \$33,396,00
Estimated Implementation Time:	4 years

This alternative includes the institutional controls, monitoring, and Site maintenance of Alternative P5B and adds (1) a system to intercept, collect, and convey the shallow ground water flow from Little Mountain away from Pond 5; (2) a multi-layered cap over the Pond 5 area that is constructed in accordance with Resource Conservation and Recovery Act ("RCRA") Subtitle "C" requirements; and (3) modifications, if necessary, to the existing Pond 5 Treatment Facility to enable the treatment facility effluent to meet current Virginia surface Water standards. This alternative requires that any needed modifications to the existing Pond 5 Treatment Facility occur initially in the remedial action phase, and the operation and maintenance of the facility be continued until the collected pond water/ground water meets Virginia surface water standards without treatment.

Alternative P5G-1: Ground water Management, Surcharging, and
Capping with Dike and Pond Materials

Estimated Capital Costs:	\$11,471,000 to \$13,654,000
Estimated Annual O&M Costs:	\$ 140,000
Estimated Present Worth Costs:	\$15,674,000 to \$17,857,000
Estimated Implementation Time:	6 years

6 For cost estimating purposes, the cost to modify the Pond 5 Treatment Facility is the cost of the Treatment Facility Upgrade in Alternative P5C-1.

This alternative includes the institutional controls, monitoring, and Site maintenance of Alternative P5B, and adds: (1) a system to intercept, collect, and convey the shallow ground water flow from Little Mountain away from Pond 5; (2) fracture sealing and surcharging of the Pond 5 materials; and (3) shaping and capping Pond 5 with dike and pond materials. The purpose of fracture sealing is to close the major paths by which water infiltrates and migrates through Pond 5. Fracture sealing is generally accomplished by pressure injection of a slurry into fractures or voids. Excavated pond materials would be processed to ensure uniformity and adjusted for moisture content, then backfilled to form the cap. This alternative includes operation and maintenance of the existing Pond 5 Treatment Facility for seven years during construction of the cap.

Alternative P5H: Ground water Management, Surcharging, and
Capping with Synthetic Liner

Estimated Capital Costs:	\$13,287,000 to \$15,346,000
Estimated Annual O&M Costs:	\$ 140,000
Estimated Present Worth Costs:	\$17,490,000 to \$19,550,000
Estimated Implementation Time:	6 years

This alternative includes the institutional controls, monitoring, and Site maintenance of Alternative P5B, and adds: (1) a system to intercept, collect, and convey the shallow ground water flow from Little Mountain away from Pond 5; (2) surcharging of the Pond 5 materials; and (3) shaping with dike materials and capping Pond 5 with a synthetic liner. Compared to Alternative P5G-1, this alternative substitutes a synthetic liner for remolded dike/pond materials as the barrier zone. Fracture sealing is not included in this alternative. This alternative includes operation and maintenance of the existing Pond 5 Treatment Facility during construction of the cap.

Alternative P5I: In-Situ Treatment, Stabilization/Chemical
Fixation, and Permeable Cover

Estimated Capital Costs:	\$62,501,000 to \$142,602,000
Estimated Annual O&M Costs:	\$ 139,000
Estimated Present Worth Costs:	\$66,675,000 to \$146,776,000
Estimated Implementation Time:	6 years

This alternative includes the institutional controls, monitoring, and Site maintenance of Alternative P5B, and adds: (1) a system to intercept, collect, and convey the shallow ground water flow from Little Mountain

away from Pond 5; (2) stabilization/chemical fixation of the pond mass; and (3) a permeable soil cover. In-situ treatment involves stabilization of mercury using a chemical reagent (additive). The material in Pond 5 would be treated with a chemical reagent that reacts with the mercury to keep the mercury from moving to the ground water and to the river. It would be necessary to utilize a specialized mixing system that injects the reagent solution into the soil/waste and provides mechanical mixing. Backhoe mounted systems typically are effective to approximately 20 feet. Deep soil augers could be used, if necessary, to extend to the full depth of the pond. After stabilization, the surface would be graded to promote drainage, covered with 18 inches of soil, and seeded. This alternative includes operation and maintenance of the existing Pond 5 Treatment Facility during stabilization/fixation of the pond mass which is estimated to be seven years.

Alternative P5J: In-Situ Treatment, Stabilization/
Solidification of Upper 20 Feet of
Soil/Waste, and Permeable Cover

Estimated Capital Costs:	\$84,115,000 to \$85,504,000
Estimated Annual O&M Costs:	\$ 139,000
Estimated Present Worth Costs:	\$88,290,000 to \$89,678,000
Estimated Implementation Time:	6 years

This alternative includes the institutional--controls, monitoring, and Site maintenance of Alternative P5B, and adds: (1) a system to intercept, collect, and convey the shallow ground water flow from Little Mountain away from Pond 5; (2) stabilization/solidification of the upper 20 feet of the Pond 5 soil/waste mass; and (3) a permeable soil cover. The soil/waste mass in the upper 20 feet would be stabilized by application of reagents and/or inert additives and mixed to produce a stable material that would inhibit infiltration of rainwater into the pond and prevent the leaching of mercury from the stabilized mass. Based on the historical data and known operational procedures of the chlorine plant, mercury was deposited along with the ammonia soda ash waste during the period that the top 20 feet of pond material was accumulated. It is estimated that 93% of the total mercury in Pond 5 is contained in the upper 20 feet of the pond material. After stabilization, the surface would be graded to promote drainage, covered with 18 inches of soil, and seeded. This alternative includes operation and maintenance of the existing Pond 5 Treatment Facility during stabilization/solidification of the upper 20 feet of the Pond 5 soil/waste mass.

Alternative P5J-1: In-Situ Treatment, Stabilization/
Solidification of Upper 20 Feet of
Soil/Waste in Areas of Suspected Highest
Mercury Concentration, Multi-layered Cap

Estimated Capital Costs:	\$25,679,000 to \$28,692,000
Estimated Annual O&M Costs:	\$ 139,000
Estimated Present Worth Costs:	\$29,854,000 to \$32,866,00
Estimated Implementation Time:	6 years

This alternative includes the institutional controls, monitoring, and Site maintenance of Alternative P5B, and adds: (1) a system to intercept, collect, and convey the shallow ground water flow from Little Mountain away from Pond 5; (2) the stabilization/solidification of the upper 20 feet of soil/waste material in the areas of Pond 5 with the highest mercury contamination (approximately 11 acres); and (3) a multi-layered cap. This alternative is based on the estimate that 93% of the total mercury in Pond 5 was deposited in the top 20 feet. Further, the data indicates that 70% of the mercury within the top 20 feet of the soil/waste is located in the eastern, western, and northern quadrants of Pond 5 (presented in order of decreasing mercury concentration). Eleven acres within those quadrants were identified for stabilization. The area not stabilized, approximately 71 acres, would be graded utilizing dike material as fill. Measures such as pre-loading with dike material or geosynthetics would be employed to improve the stability of the subgrade. Fill would be placed to shade the surface to provide a free draining surface. After the shaping of the pond surface is completed, a flexible membrane liner would be placed on top of the prepared surface. A geocomposite would be placed above the liner to serve as a drainage layer. An 18 inch vegetative soil zone would be placed above the geocomposite and seeded. This alternative includes operation and maintenance of the existing Pond 5 Treatment Facility during the stabilization/ solidification of the top 20 feet of soil/waste material in the areas with the highest mercury contamination (approximately 11 acres) and construction of the multi-layered cap.

7.2 Pond 6 Alternatives

The alternatives for Pond 6 are as follows:

!	Alternative P6A:	No Action
!	Alternative P6B:	Institutional Controls, Maintenance, Monitoring, and pH Adjustment
!	Alternative P6C:	Permeable Soil Cover
!	Alternative P6D:	Permeable Soil Cover and Localized Containment of Demolition Debris with Vertical Barrier Wall and RCRA Cap
!	Alternative P6D-1:	RCRA Cap, Localized Containment of Demolition Debris with Vertical Barrier Wall, and Surface water Management
!	Alternative P6E:	Permeable Soil Cover and Consolidation of Demolition Debris onto Pond 5

Alternative P6A: No Action

Estimated Capital Costs:	\$0
Estimated Annual O&M Costs:	\$0
Estimated Present Worth Costs:	\$0
Estimated Implementation Time:	Immediate

This alternative assumes the present institutional controls and Site maintenance and monitoring programs will not be continued. It is further assumed that residential development could occur on the Site. Drinking water would be provided by the local water utility. The installation of private wells for drinking water would not be feasible due to the low yield and high salt content of the groundwater.

Alternative P6B: Institutional Controls, Maintenance
Monitoring, and pH Adjustment

Estimated Capital Costs:	\$ 601,000
Estimated Annual O&M Costs:	\$ 53,000
Estimated Present Worth Costs:	\$2,190,000
Estimated Implementation Time:	1 year

This alternative includes maintenance of outfall monitoring, an expanded ground water monitoring program, Site maintenance, and institutional controls (e.g., maintenance of fencing, deed restrictions, and security measures). Deed restrictions would restrict future land use and the installation of wells on Pond 6. The Site security measures would be formalized and the existing fencing maintained. The Site maintenance program would include regular, documented inspections of the overall Site, including fencing, access roads, monitoring wells, and existing drainage control structures. The existing maintenance program would be expanded to include measures such as top-seeding and fertilization to enhance the existing vegetation. Additional monitoring wells would be installed in the vicinity of the demolition debris and spaced around Pond 6 in order to monitor the subsurface flow of ground water and provide data to evaluate water quality over time. A pH adjustment system would also be provided at the existing Pond 6 outfall to neutralize the discharge.

Alternative P6C: Permeable Soil Cover

Estimated Capital Costs:	\$4,545,000
Estimated Annual O&M Costs:	\$ 62,000
Estimated Present Worth Costs:	\$6,408,000
Estimated Implementation Time:	3 years

This alternative includes the requirements of Alternative P6B and adds a permeable soil cover over Pond 6, including the demolition debris burial area. Measures to improve the stability of the subgrade may be necessary. After shaping of the subgrade is completed, a minimum of twelve inches of soil fill will be placed on the improved subgrade, then covered with six inches of topsoil, fertilized, and seeded.

Alternative P6D: Permeable Soil Cover and Localized
Containment of Demolition Debris with
Vertical Barrier Wall and RCRA Cap

Estimated Capital Costs:	\$5,598,000
Estimated Annual O&M Costs:	\$ 62,000
Estimated Present Worth Costs:	\$7,462,000
Estimated Implementation Time:	3 years

This alternative includes the requirements of Alternative P6B and adds: (1) containment of the demolition debris from the former chlorine plant; and (2) a permeable soil cover over Pond 6 (except for the demolition debris burial area). Containment measures for the debris area would include a vertical barrier wall placed around the perimeter of the debris and a multi-layered cap that is constructed in accordance with RCRA Subtitle "C" requirements. With respect to the remainder of Pond 6 (i.e., the area other than the debris area), measures to improve the stability of the subgrade may be necessary. After shaping of the subgrade is completed, soil fill would be placed on the improved subgrade to a minimum thickness of twelve inches, then covered with six inches of topsoil, fertilized and seeded.

Alternative P6D-1: RCRA Cap, Localized Containment of Demolition Debris with Vertical Barrier Wall, and Surface Water Management.

Estimated Capital Costs:	\$12,686,000
Estimated Annual O&M Costs:	\$ 65,000
Estimated Present Worth Costs:	\$14,628,000
Estimated Implementation Time:	4 years

This alternative includes the requirements of Alternative P6B and adds: (1) containment of the demolition debris from the former chlorine plant; (2) a multi-layered cap over the entire Pond 6 area, including the demolition debris area, that is constructed in accordance with RCRA Subtitle "C" requirements; and (3) surface water management. Containment measures for the debris area would include a vertical barrier wall placed around the perimeter of the debris. To implement the surface water management component included in this alternative, a system would be implemented to intercept, collect and convey the surface water runoff from Little Mountain away from Pond 6.

Alternative P6E: Permeable Soil Cover and Consolidation of Demolition Debris onto Pond 5

Estimated Capital Costs:	\$11,596,000
Estimated Annual O&M Costs:	\$ 62,000
Estimated Present Worth Costs:	\$13,460,000
Estimated Implementation Time:	3 years

This alternative includes the requirement of Alternative P6B and adds (1) a low permeability soil cover over Pond 6; (2) removal of the demolition debris from the former chlorine plant; and (3) final disposition of the demolition debris to Pond 5. The buried debris from the demolition of the former chlorine plant would be excavated from Pond 6 with conventional earthwork equipment, hauled, and spread over a prepared area within Pond 5. The resulting excavation at Pond 6 would be backfilled with local material and graded to promote proper drainage.

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial action alternatives described above were evaluated using the following criteria, as required under Section 300.430 (e) (9) (iii) of the NCP, 40 C.F.R. § 300.430 (e) (9) (iii):

Threshold Criteria: Statutory requirements that each alternative must satisfy in order to be eligible for selection.

1) Overall Protection of Human Health and the Environment.

Evaluation of the ability of each alternative to provide adequate protection of human health and the environment in the long and short-term and of how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2) Compliance with Applicable or Relevant and Appropriate

Requirements ("ARARs")

Evaluation of the ability of each alternative to attain applicable or relevant and appropriate requirements under federal environmental laws and state environmental or facility siting laws or provide grounds for invoking a waiver established under CERCLA.

Primary Balancing Criteria: Technical criteria upon which the detailed analysis of the alternatives is primarily based.

3) Long-Term Effectiveness and Permanence

Evaluation of expected residual risk and the ability of each alternative to maintain reliable protection of human health and the environment over time after cleanup requirements have been met.

4) Reduction of Toxicity, Mobility, or Volume through Treatment
Evaluation of the degree to which an alternative employs treatment methods to reduce the toxicity, mobility, or volume of hazardous substances at the Site.

5) Short-Term Effectiveness

Evaluation of the period of time needed for each alternative to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period.

6) Implementability

Evaluation of the technical and administrative feasibility of each alternative, including the availability of materials and services.

7) Cost

Section 121 of CERCLA, 42 U.S.C. § 9621, requires selection of a cost-effective remedy that protects human health and the environment and meets the other requirements of the statute. Alternatives are compared using present worth cost, which includes all capital costs and the operation and maintenance costs incurred over the life of the project. Capital costs include expenditures necessary to implement a remedial action (e.g., construction costs). All costs presented are estimates calculated for comparison purposes only.

Modifying Criteria: Criteria considered throughout the development of the preferred remedial alternative and formally assessed after the public comment period, which may modify the preferred alternative.

8) State Acceptance

Assessment of technical and administrative issues and concerns that the State may have regarding each alternative.

9) Community Acceptance

Assessment of issues and concerns the public may have regarding each alternative based on a review of public comments received on the Administrative Record and the Proposed Plan.

8.1 Overall Protection of Human health and the Environment

Pond 5 Alternatives P5F through P5J-1 provide adequate protection of human health by preventing exposure to the contaminated soil/waste material and reducing the discharge of mercury to the river. Each of these alternatives requires monitoring of the river and nearby ground water to ensure that the mercury remains at acceptable levels for protection of human health and the environment.

Alternatives P5I, P5J, and P5J-1 offer advantages over the other alternatives because they provide for active treatment of the contaminated pond material, which would minimize migration of contaminants and diminish loading of contaminants to the river. Alternatives P5F, P5F-X, P5G-1, and P5H all include an impermeable cap which would inhibit migration of contaminants into ground water by reducing the amount of precipitation that may infiltrate and mobilize contaminants in the wastes, and would prevent exposure of ecological receptors to mercury-contaminated waste. Alternative P5F-X is advantageous over the other capping alternatives (P5F, P5G-1, and P5H) due to the reduced permeability and superior performance of the RCRA Subtitle "C" cap.

Alternatives P5A, P5B, and P5C-1 contain no provisions for preventing exposure to contamination, and are not protective of human health and the environment. Although Alternative P5C-1 includes measures for reducing the mercury in the Pond 5 effluent to acceptable levels, none of these alternatives would prevent receptors from exposure to the mercury-contaminated waste. Since Alternatives P5A, P5B, and P5C-1 do not meet the threshold criterion of protection of human health and the environment, they will not be discussed in the remainder of this section.

Pond 6 Alternatives P6C through P6E provide adequate protection of human health by preventing exposure to the contaminated pond material. Each of these alternatives requires monitoring of the river and nearby ground water to ensure that the mercury remains at acceptable levels for protection of human health and the environment.

Alternatives P6D, P6D-1, and P6E offer advantages over the other alternatives because they include remedial actions to specifically address the demolition debris from the former chlorine plant buried in Pond 6. Both Alternatives P6D and P6D-1 require containment measures to isolate the buried debris. Alternative P6E would excavate the buried debris from Pond 6 and consolidate this material with the waste material in Pond 5. Alternative P6D-1 is increasingly more protective as it adds a RCRA Subtitle C cap over the entire Pond 6 area to stop rainfall and surface water runoff from contacting the pond material. In addition, Alternative P6D-1 adds a component to prevent surface water runoff from contacting the pond material.

Alternatives P6A and P6B contain no provisions for preventing exposure to contamination, and are not protective of human health and the environment. Since Alternatives P6A and P6B do not meet the threshold criterion of protection of human health and the environment, they will not be discussed in the remainder of this section.

8.2 Compliance with ARARs

The Federal and State requirements or criteria with which a Superfund remedy must comply are called Applicable or Relevant and Appropriate Requirements. In this section of the ROD, EPA has identified certain ARARs which the alternatives are required to meet. A complete discussion of ARARs for the selected remedies for Pond 5 and Pond 6 appears in Sections 9.1.1 through 9.3.3 of this ROD. Because the Commonwealth of Virginia administers an authorized state RCRA program, the Virginia Hazardous Waste Management Regulations ("VHWMR") will serve as the governing ARAR in place of the Federal RCRA regulations contained in Volume 40 of the Code of Federal Regulations, except for the Land Disposal Restrictions ("LDRs") set forth in 40 C.F.R. Part 268. (At this time, Virginia does not have authorization for administering LDRs).

Pond 5 Of the alternatives being considered (P5F through P5J-1), Alternatives P5F, P5G-1, and P5H will not meet the action-specific closure requirements for a surface impoundment closed as a landfill specified under VHWMR Section 9.10F and 40 C.F.R. § 264.310, and will not be discussed as viable options in the remainder of this section. Alternatives P5F-X, P5I, P5J, and P5J-1 will meet these closure requirements.

Alternatives P5F-X, P5I, P5J, and P5J-1 will meet the chemical-specific ARAR for Surface water discharge to the river by achieving a maximum mercury concentration equal to or less than the effluent discharge limit that will be established by the Virginia Department of Environmental Quality ("VDEQ"), under its Virginia Pollutant Discharge Elimination System ("VPDES") regulations (VR 680-14-01), administered by VDEQ

pursuant to Section 304 of the Clean Water Act. Virginia surface water standards are "in stream" maximum concentrations that will be used by the VPDES program to determine maximum allowable concentrations in surface water discharges. In accordance with the Virginia surface water standards, when calculating the maximum allowable discharge concentration for the protection of aquatic life (chronic toxicity), the effect of dilution is based on the lowest flow over a seven-day period with a recurrence interval of ten years. The current Virginia surface water standard for mercury is 0.012 ug/l.

The treatment of groundwater in Alternatives P5F-X, P5I, P5J, and P5J-1 may result in the generation of sludges or other metal-containing waste. Any sludges or other metal-containing waste would be evaluated in accordance with the hazardous waste identification requirements of 40 C.F.R. Part 261, Subpart C and VHWMP Part III. If temporary onsite storage of sludges and other metal-containing waste becomes necessary prior to transporting off-site for treatment and disposal, such storage shall be in compliance with VHWMP Part IX. On-site management of any sludges or other metal-containing wastes found to exhibit characteristic of a hazardous waste would comply with the substantive requirements of 40 C.F.R. Part 262 and VHWMP Part VI that pertain to generators of hazardous waste. In addition, preparation of waste for off-site disposal will comply with 40 C.F.R. Part 263 and VHWMP Part VII. Transportation of sludges and other metal-containing waste shall be in compliance with 40 C.F.R. Part 263 and MR Part VII, and 49 C.F.R. Parts 107 and 171-179 regulating the transportation of hazardous waste, and Virginia Regulations Governing the Transportation of Hazardous Materials (VR 672-30-1). The groundwater collected and treated under these alternatives will be treated to meet the substantive requirements of the VPDES regulations prior to discharge to the river, including effluent discharge limits and monitoring requirements. Treatment of the Pond 5 effluent will continue until the completed remedial action has demonstrated through monitoring results that the Pond 5 effluent complies with the VPDES requirements without treatment.

Alternatives P5F-X, P5I, P5J, and P5J-1 will comply with the substantive requirements of the following Federal and State environmental laws and regulations: stormwater effluent flow requirements of VPDES, stormwater management requirements of the Virginia Stormwater Management Act and Virginia Stormwater Management Regulations (VR 215-02-00), Virginia Erosion and Sediment Control Regulations (VR 625-02-00), Virginia Impounding Structure Regulations (VR 625-01-00); Federal requirements for the protection of floodplains and wetlands (Executive Orders 11988 and 11990) and the Virginia Water Protection Program Regulations (VR 680-15-02); Federal requirements for the protection of endangered species (16 U.S.C. § 1531 et seq.; 50 C.F.R. Part 402) and the Virginia Endangered Species Act (Code of Virginia §§ 29.1 - 563); and the Archaeological and Historical Preservation Act of 1974 (16 U.S.C. § 469 and 36 C.F.R. Part 65).

Pond 6 Alternatives P6C through P6E will meet the chemical-specific ARAR for surface water discharge to the river described above for Pond 5. Monitoring of the Pond 6 effluent has indicated that the mercury concentration in the discharge from Pond 6 has typically been non-detectable. Alternatives P6C through P6E will also comply with the substantive requirements of the Federal and State environmental laws described above for Pond 5.

8.3 Long-Term Effectiveness and Permanence

Alternatives P5F-X, P5I, P5J, and P5J-1 all have the potential to provide long-term effectiveness. Alternative P5F-X provides containment of the Pond 5 wastes through a highly impermeable cap. Capping is a proven technology a properly maintained cap would provide long-term isolation of source materials and risk reduction. In addition, this alternative provides for the treatment of Pond 5 effluent to Virginia surface water standards and will continue to do so until monitoring of the Pond 5 effluent demonstrates that the Virginia surface water standards are met without treatment.

Alternatives P5I, P5J, and P5J-1 employ a method of in-situ treatment of the contaminated pond material. These alternatives would involve the use of a chemical reagent to react with the waste material rendering it less permeable and reduce the mercury to a less soluble form (i.e., less susceptible to transport by water). The effectiveness of the in-situ treatment alternatives in eliminating leachable mercury cannot be accurately predicted without additional field studies; however, treatment of waste typically provides a greater degree of long-term effectiveness.

Pond 6 Alternatives P6C, P6D, P6D-1, and P6E all have the potential to provide long-term effectiveness. These alternatives all include, either as the remedy or a component of the remedy, a permeable soil cover and/or a RCRA Subtitle "C" cap that would eliminate direct contact with the contaminated waste material and a pH adjustment component to neutralize the Pond 6 effluent. Although the presence of mercury in Pond 6 has been established, there have not been significant concentrations of mercury measured at the Pond 6 outfall. The mercury concentration in the Pond 6 outfall has usually been non-detectable.

EPA recognizes that the permeable cover component in Alternative P6C does not eliminate the possibility of mercury in Pond 6 migrating through the subsurface and entering the river via the Pond 6 decant structure or possibly migrating through the Pond 6 dike. To account for this uncertainty, a detailed long-term monitoring plan will be developed for the Site.

Alternatives P6D and P6E supplement the permeable soil cover with additional components to isolate or remove the former chlorine plant buried debris and therefore provide higher degrees of long-term effectiveness than Alternative P6C. Furthermore, Alternative P6D-1 supplements a RCRA Subtitle C compliant cap for the entire Pond 6 area with containment of the demolition debris using a vertical barrier wall and therefore provides a higher degree of long-term effectiveness than Alternatives P6C or P6D.

8.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Pond 5 Only Alternatives P5I, P5J, and P5J-1 include measures to reduce the mobility of the mercury through treatment. None of the alternatives reduce the toxicity or the quantity of mercury in the soil/waste in Pond 5. The Pond 5 Treatment Facility would be used to some extent in all of these alternatives to address contaminated water collected from Pond 5. The duration of the facility's operation will depend on the effectiveness of the ground water controls and/or the treatment technologies of the respective alternatives. The carbon adsorption components of the ground water treatment process will produce contaminated sludges and materials which will have to be disposed of offsite.

Alternative P5F-X provides in-place containment of Pond 5 waste material, which does not reduce the toxicity or volume of these wastes. However, the cap would decrease the mobility of contaminants by reducing the amount of water that may infiltrate the wastes and cause contaminants to move into the ground water.

Pond 6 The alternatives being considered for the Pond 6 area would not result in any overall reduction of toxicity, mobility, or volume of contaminants through treatment. Alternatives P6C and P6D provide for a permeable soil cover to reduce erosion of surface pond material containing mercury and the neutralization of the Pond 6 effluent to reduce the alkalinity of the pond effluent discharged to the river. Alternatives P6D, P6D-1, and P6E provide measures to reduce the potential mobility of the mercury from the buried demolition debris area. Alternative P6E provides for the consolidation of the mercury-contaminated demolition debris to the Pond 5 area.

8.5 Short Term Effectiveness

Pond 5 Institutional controls and Site access limitations have been implemented and are currently maintained at the Pond 5 area. In the short term, Alternatives P5F-X through P5J-1 would be effective in maintaining the existing level of protection. All alternatives provide for continued operation of the Pond 5 Treatment Facility. Alternative P5F-X would require that any modifications to the Pond 5 Treatment Facility needed to achieve the current Virginia surface water standard for mercury would be completed in the initial phase of remedial action. All other alternatives provide for the continued operation of the existing facility during the remedy implementation period. The alternatives anticipate that the Pond 5 effluent will meet the Virginia surface water standard without treatment after implementation of the remedy is complete. In this respect, Alternative P5F-X may provide a higher degree of short-term effectiveness than those alternatives which do not require potential modifications to the Pond 5 Treatment Facility to achieve the Virginia surface water standards.

Implementation of these alternatives would present a potential for exposure of workers to Site contaminants during cap construction activities, in-situ treatment activities, installation of ground water monitoring and extraction wells, construction of any needed modifications to and operation of the Pond 5 Treatment Facility, and sampling activities. In addition, workers would be exposed to normal construction hazards. However, these risks would be reduced to acceptable levels by following proper health and safety practices.

Implementation of each of these alternatives would pose an additional short-term risk to workers and neighboring populations as a result of the generation of dust during the cap construction or in-situ treatment activities. An air monitoring program would be implemented to ensure that unacceptable air releases do not occur.

Pond 6 Institutional controls and Site access limitations have been implemented and are currently maintained at the Pond 6 area. In the short-term, Alternatives P6C through P6E would be effective in maintaining the existing level of protection. These alternatives include a pH neutralization component which would result in a neutral discharge of Pond 6 effluent to the river.

Implementation of the Pond 6 alternatives would present a potential for exposure of workers to Site contaminants during cap construction activities, installation of the vertical barrier wall around the buried debris (if required), installation of ground water monitoring and extraction wells, and sampling activities. In addition, workers would be exposed to normal construction hazards. However, these risks would be reduced to acceptable levels by following proper health and safety practices.

Alternative P6E would pose an additional short-term risk to workers and neighboring populations as a result of the generation of dust during the excavation and consolidation of buried debris to the Pond 5 area. An air monitoring program would be implemented to ensure that unacceptable air releases do not occur. This additional risk inherent in these activities would be addressed in the Site Health and Safety Plan.

8.6 Implementability

Pond 5 Alternatives P5F-X through P5J-1 will require construction activities on the surface of Pond 5 and therefore have uncertainties in implementability associated with the properties of the pond material. The capacity of the pond material to bear the weight of the cap and/or construction equipment must be addressed during remedial design if one of these alternatives is implemented. The use of geosynthetics as a possible component of the final cap is recognized as being implementable and effective for RCRA Subtitle "C" applications. Geosynthetics have been used successfully in providing a base upon which fill can be placed over an unstable subsoil. Consideration of settlement of the Pond 5 waste material must be included in the design and implementation of Alternatives P5F-X through P5J-1 for Pond 5.

Ion exchange is a ground water treatment technology that could be used if modification of the Pond 5 Treatment Facility is necessary in Alternative P5F-X. This technology has been successfully demonstrated in full-scale operations or the removal of mercury. However, a treatability study may be necessary to ensure that this technology could be used effectively if modification of the Pond 5 Treatment Facility is needed to meet the current Virginia surface water standard for mercury.

Alternatives P5I, P5J, and P5J-1 have uncertainty relative to their effectiveness in adequately stabilizing the pond material to immobilize the mercury. Proper mixing of reagents with the pond material presents some uncertainty. Field treatability studies would be required to determine the appropriate reagent/additive, the method of application, and the limits of treatment. Verification of the success of these alternatives would require an extensive quality assurance plan.

Alternatives P5J and P5J-1 call for treatment of the top 20 feet of the Pond 5 material. There remains some uncertainty regarding the migration of mercury to lower depths within Pond 5 if only the top 20 feet of pond material were stabilized.

Worker exposure and protective equipment requirements for construction activities can be readily achieved for all of the alternatives. All alternatives which include construction activities on the surface of the pond would provide appropriate measures to control fugitive emissions and would provide for monitoring of the air for mercury.

Pond 6 Alternatives P6C through P6E would require construction activities on the surface of Pond 6 and therefore have uncertainties associated with the properties of the pond material as discussed above for Pond 5.

Worker exposure and protective equipment requirements for construction activities can be readily achieved for all of the alternatives. All alternatives which include construction activities on the surface of the pond would provide appropriate measures to control fugitive emissions and would provide for monitoring of the air for mercury.

8.7 Cost

The estimated present worth costs of the viable alternatives remaining for Pond 5 and Pond 6 are presented in Table 5. These costs represent the "present worth value" of all future costs activities (capital costs and operation and maintenance costs) associated with each alternative.

Table 5 - Present Worth Costs

Pond 5

Pond 6

Alternative P5F-X	\$30,471,000 - \$33,396,000	Alternative P6C	\$ 6,408,000
Alternative P5I	\$66,675,000 - \$146,776,000	Alternative P6D	\$ 7,462,000
Alternative P5J	\$88,290,000 - \$89,678,000	Alternative P6D-1	\$14,628,000
Alternative P5J-1	\$29,854,000 - \$32,866,000	Alternative P6E	\$13,460,000

8.8 State Acceptance

VDEQ had the opportunity to review and comment on all the documents in the Administrative Record and on the draft ROD. Although the Commonwealth's comments have been incorporated into the ROD, the Commonwealth of Virginia has not concurred with this ROD.

8.9 Community Acceptance

The community has been in general agreement with the alternatives for Ponds 5 and 6 selected in this ROD. The company that owns the Site has, however, indicated its opposition to some components of the chosen alternatives. Oral and written comments on the remedial alternatives evaluated by EPA for implementation at Ponds 5 and 6 are included in Part III (Responsiveness Summary) of this ROD.

9.0 SELECTED REMEDY PERFORMANCE STANDARDS

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives using the nine criteria, and public comments, EPA has determined that Alternative P5F-X (Ground water Management and RCRA Cap with Pond 5 Treatment Facility Upgrade) is the most appropriate remedy for Pond 5, and a modified version of Alternative P6D is the most appropriate remedy for Pond 6 of the Saltville Waste Disposal Ponds Superfund Site.

Alternative P5F-X and the modified Alternative P6D for Ponds 5 and 6, respectively, meet the threshold criteria of overall protection of human health and the environment and compliance with ARARs, and provide the best balance of long-term effectiveness and permanence, reduction of toxicity, mobility or volume of contaminants through treatment, short-term effectiveness, implementability, and cost.

As indicated earlier in this document, EPA has elected to defer a decision on the remedy for the Former Chlorine Plant Site. After a detailed review of the comments received during the public comment period, EPA concluded that there remains a high degree of uncertainty regarding the level of mercury migrating to the river from the Former Chlorine Plant Site. To make the appropriate remedy decision for this area, EPA believes additional data is required to further characterize the impact that mercury contamination at the Former Chlorine Plant Site is having on the river. Additional study will be conducted concurrently with the ongoing study of the river. A separate Proposed Remedial Action Plan documenting EPA's preferred remedial action for the final operable unit at the Site will address both the river and the Former Chlorine Plant Site.

9.1 Pond 5

The selected remedy for the Pond 5 area considers of the following major components:

- ! Installation of a multi-layered cap over the entire Pond 5 area;
- ! Ground water interceptor system;
- ! Revision of the effluent discharge limit for the existing Pond 5 Treatment Facility to achieve the current Virginia surface water standard for mercury and any modification of the Pond 5 Treatment Facility necessary to achieve the revised discharge limit;
- ! Institutional Controls;
- ! Maintenance of the Site security and maintenance programs;
- ! Long-term Monitoring.

The specific requirements and performance standards for the first three components listed above are presented in the following section. The remaining components are also common to the selected remedy for Pond 6 and the

requirements for these components are presented in Section 9.3.

9.1.1 Multi-Layered Cap

1. A multi-layered cap shall be installed over Pond 5 in accordance with RCRA Subtitle C requirements, 40 C.F.R. Part 264, Subparts G and N, and VHWMR § 10.13.K, to reduce the infiltration of surface water and migration of contaminants into the ground water. The cap shall cover the entire Pond 5 area of approximately 75 to 80 acres.
2. Air monitoring for dust and Site contaminants shall be performed in accordance with the federal Clean Air Act, 42 U.S.C. § 7401 et seq., and 40 C.F.R. Part 50, to ensure any air emissions conform with the National Primary and Secondary Ambient Air Quality Standards. Fugitive dust emissions shall also be controlled in accordance with the Virginia Air Pollution Control law, Code of Virginia §§ 10.1-1300 et seq., and the Virginia Regulations for the Control and Abatement of Air Pollution, VR § 120-01.
3. Erosion and sediment control measures shall be implemented and maintained in accordance with the substantive requirements of the Virginia Erosion and Sediment Control Law, Code of Virginia §§ 10.1-560 et seq., and the Virginia Erosion and Sediment Regulations, VR § 625-02-00. An erosion and sediment control plan shall be prepared and submitted to EPA for approval during the remedial design phase.
4. All equipment used during excavation of contaminated soil shall be decontaminated before entering uncontaminated areas. The design and specifications for the decontamination facilities shall be approved by EPA as part of the remedial design. Any discharge of water generated from Site decontamination activities shall be in compliance with the Virginia State Water Control Law, Code of Virginia §§ 62.1-44.2 et seq., and the Virginia State Water Control Board Regulations (VR 680-21-00).

9.1.2 Ground water Interceptor System

1. An interceptor system shall be constructed to minimize the upgradient subsurface flow (i.e., fracture flow from Little Mountain) from coming in contact with the contaminated waste material in Pond 5. The standards and specifications for the ground water interceptor system shall be approved by EPA during the remedial design phase.

9.1.3 Pond 5 Treatment Facility

1. Water collected through the Pond 5 decant structure shall be conveyed to the existing Pond 5 Treatment Facility, treated, and discharged to the river in accordance with effluent limits and flow rates established by the VDEQ Water Division under the Virginia State Water Control Law, Code of Virginia §§ 62.1-44.2 et seq., and the Virginia Pollutant Discharge Elimination System Regulations (VR 680-14-01). The existing effluent limit shall be modified to be in compliance with the current Virginia surface water standard for mercury.
2. Process modifications to the existing Pond 5 treatment Facility may be required to attain compliance with the modified effluent limit. EPA shall determine if

modifications are necessary during the remedial design phase. If modifications are necessary, these modifications shall be implemented upon EPA approval of the final design standards and specifications for the needed modifications.

3. Sludges and other metal-containing waste generated by the groundwater treatment process shall be tested using Toxicity Characteristic Leaching Procedure to determine if they exhibit characteristics of hazardous waste, pursuant to 40 C.F.R. Part 261, Subpart C and VHWMR Part III. Sludges and other metal-containing waste that do not exhibit hazardous characteristics during testing shall be disposed of off-site at a permitted RCRA Subtitle D facility; sludges and other metal-containing waste that exhibit hazardous characteristics shall be transported off-site for treatment and disposal at a permitted RCRA Subtitle C facility or an approved alternative. If temporary onsite storage of sludges and other metal-containing waste becomes necessary prior to transporting off-site for treatment and disposal, such storage shall be in compliance with VHWMR § 9.8 Use and Management of Containers, or § 9.9 Tanks. On-site management of any sludges or other metal-containing waste found to exhibit a characteristic of a hazardous waste shall comply with the substantive requirements of 40 C.F.R. Part 262 and VHWMR Part VI that pertain to generators of hazardous waste. Preparation and transportation of sludges and other metal-containing waste shall be in compliance with 40 C.F.R. Part 263 and VHWMR Part VII, and 49 C.F.R. Parts 107 and 171-179 regulating the transportation of hazardous waste, and Virginia Regulations Governing the transportation of Hazardous Materials (VR 672-30-1). Waste disposal shall comply with regulations found at 40 C.F.R. § 300.440.
4. Chemical monitoring shall be performed to evaluate the performance of the Pond 5 Treatment Facility and detect any impacts to the river. The monitoring requirements shall be developed during the remedial design in accordance with the Virginia State Water Control Law, Code of Virginia §§ 62.1-44.2 et seq., and Virginia Pollution Discharge Elimination System Regulations (VR 680-14-00), and require EPA approval.

9.2 Pond 6

The selected remedy for Pond 6 is a combination of Alternatives P6C and P6D identified in the FS Report and the Proposed Plan. The selected remedy for Pond 6 and the contingent remedial action consists of the following components:

- ! A permeable soil cover over the entire Pond 6 area of approximately 40 to 45 acres, including the demolition debris burial area;
- ! A pH adjustment system to neutralize the discharge from the Pond 6 decant structure;
- ! Institutional controls;
- ! Maintenance of the Site security and maintenance programs;
- ! Long-term monitoring, including installation of monitoring well (s) downgradient of buried debris.

The following additional remedial action shall be required if mercury contamination from the buried debris is demonstrated to be migrating toward the river through the ground water in Pond 6:

- ! Isolation of Former Chlorine Plant Site demolition debris buried in the eastern end of Pond 6 by vertical barrier wall and a multi-layered cap over the two to three acres where the debris is buried.

9.2.1 Permeable Soil Cover

1. A uniform and compacted layer of soil shall be placed over the entire area of Pond 6, approximately 40 to 45 acres. This soil cover shall (1) prevent human contact with the waste material in the Pond 6 area; (2) be capable of supporting a vegetative cover; and (3) be sufficiently compact so as not to crack excessively when dry. The cover shall be maintained to ensure continued compliance with these requirements.
2. Vegetation shall be established on the Pond 6 soil cover to stabilize the soil surface and minimize erosion. Mulch shall be applied to regraded areas where necessary to control erosion, promote germination of seeds, and increase the moisture retention of the soil.
3. Air monitoring, erosion and sediment control, and decontamination shall be performed in accordance with the requirements identified for the Pond 5 multi-layered cap in Sections 9.1.1(2), (3), and (4), respectively, of this ROD.

9.2.2 Decant Structure Discharge Neutralization

1. A pH adjustment system shall be constructed to neutralize the discharge from the Pond 6 decant structure to an acceptable range. The acceptable range will be determined by the VDEQ Water Division in accordance with Virginia State Water Control Law, Code of Virginia §§ 62.1-44.2 et seq., and Virginia Pollutant Discharge Elimination System Regulations (VR 680-14-01). The system to be used to comply with the established pH range and the specifications of the pH adjustment system shall be approved by EPA during the remedial design.

9.2.3 Contingent Remedial Action: Cap and Vertical Barrier Wall

1. One or more ground water monitoring wells (i.e., trigger wells) shall be installed downgradient of the Pond 6 buried debris area for the purpose of detecting any mercury that may be migrating toward the Pond 6 decant structure and ultimately discharged into the river. The location of the monitoring well(s), the appropriate screening interval(s), and the frequency of sampling shall be determined during remedial design.
2. Ground water modeling shall be conducted to estimate the concentration of mercury in a trigger well that could result in a discharge from the Pond 6 decant structure exceeding the Virginia surface water standard for mercury. Conservative assumptions shall be used in the model because of the uncertainties inherent in such calculations. EPA shall determine, based on this ground water modeling and any other information deemed appropriate, the mercury concentration (i.e., action level) which, if exceeded in any of the newly installed ground water monitoring wells and in a subsequent confirmatory sample, shall trigger implementation of the contingency actions to isolate the

debris buried in Pond 6.

3. If the mercury concentration in a ground water monitoring well installed to detect migration of contamination from the debris buried in Pond 6 exceeds the action level established by EPA in Section 9.2.3(2), above, a confirmatory sample shall be collected and analyzed for mercury. If the analytical result from the confirmatory sample also exceeds the action level, the contingency actions described below in Section 9.2.3(3)(a) and (b) shall be implemented.
 - a. A multi-layered cap shall be installed over the demolition debris burial area in accordance with the requirements identified for the Pond 5 multi-layered cap in Section 9.1.1, above, of this ROD. The cap shall cover the entire buried debris area, approximately two to three acres.
 - b. Vertical barrier walls shall be placed around the perimeter of the debris to contain the waste. The appropriate process option to satisfy this requirement and the standards and specifications for implementation shall be approved by EPA during remedial design.

9.3 Common Elements

The following remedial action components and performance standards are required for both the Pond 5 and Pond 6 selected remedies:

9.3.1 Long-term Monitoring

1. A long-term groundwater monitoring program shall be implemented to evaluate subsurface flow conditions and water quality in the Pond 5 and Pond 6 areas, specifically the seepage of contaminated ground water migrating through the dikes to the river. The number of new wells, the exact location of the new wells, and the associated screen depth of the new wells shall be approved by EPA during the remedial design. Supplemental sampling of existing onsite wells may be incorporated into the long-term monitoring program. Samples shall be collected and analyzed for mercury on a quarterly basis for a period of 30 years. The Pond 6 decant structure outfall shall be sampled and analyzed for mercury and pH quarterly for a period of 30 years.

9.3.2 Site Maintenance

1. A long-term Site maintenance program shall be implemented. The program will include regular, documented inspections of the overall Site including but not limited to, security fencing, access roads, monitoring wells, the Eastern Diversion Ditch, the Western Diversion Ditch, the Pond 5 dike, the Pond 6 dike and the Pond 5 Treatment Facility. Documented inspections shall also include inspection of the remedial action components required under this ROD (i.e., the Pond 5 RCRA Subtitle "C" cap, the Pond 5 ground water interceptor system, the Pond 6 permeable cover, and the Pond 6 neutralization system) as construction is completed and the components become operational and functional. If any of the components are found to be in a state of disrepair, those items shall be repaired and documented in an inspection report. The frequency and duration of

inspections and procedure for reporting will be determined by EPA during the remedial design.

2. Maintenance of the Pond 5 cap shall be performed in accordance with 40 C.F.R. Part 264, Subpart G and N, and VHWMR §10.6.H. and §10.13.K to prevent degradation of the cap and to ensure long-term effectiveness.
3. Inspection and maintenance of Pond 5 and Pond 6 impoundment structures (i.e., the dikes) shall comply with Virginia Impounding Structure Regulations (VR 625-01-00).
4. The existing fence shall be maintained in a manner sufficient to prevent unauthorized access to the Pond 5 and Pond 6 areas.

9.3.3 Institutional Controls

1. A deed restriction shall be placed on the Pond 5 and Pond 6 property prohibiting development of the property or the use of the ground water from that area as a potable source.

10.0 STATUTORY DETERMINATIONS

EPA's primary responsibility at Superfund sites is to select remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA 42 U.S.C. § 9621, establishes several other statutory requirements and preferences. These requirements and preferences specify that, when complete, the selected remedial action for a site must Comply with applicable or relevant and appropriate requirements established under Federal and State environmental laws, unless a statutory waiver is justified. The selected remedy must also be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The statute also contains a preference for remedies that employ treatment as a principal element.

10.1 Protection of Health and the Environment

The selected remedies for Ponds 5 and 6 will provide adequate protection of human health and the environment as follows:

Pond 5 The selected remedy for Pond 5 will effectively isolate the Pond 5 soil/waste and minimize migration of mercury from Pond 5 thus addressing the human health concerns presented in the Baseline Risk Assessment. The remedy addresses all exposure pathways identified in the Baseline Risk Assessment. Moreover, operation of the Pond 5 Treatment Facility in compliance with the current Virginia surface water standards will provide increased protection of human health and the environment.

Pond 6 The selected remedy for Pond 6 will effectively cover the Pond 6 soil/waste and address the human health concerns presented in the Baseline Risk Assessment and all exposure pathways identified in the Baseline Risk Assessment.

10.2 Compliance with Applicable or Relevant and Appropriate Requirements

Under Section 121(d) of CERCLA, 42 U.S.C. § 9621(d), and EPA guidance, remedial actions at Superfund sites must attain legally applicable or relevant and appropriate Federal and State environmental standards, requirements, criteria, and limitations (collectively referred to as ARARs). Applicable requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address hazardous material found at the site, the remedial action to be implemented at the site, the location of the site, or other circumstances at the site. Relevant and appropriate requirements are those which, while not directly applicable to the site, nevertheless address problems or situations sufficiently similar to those encountered at the site that their use is well suited to that site.

The selected remedy will comply with all applicable or relevant and appropriate requirements. These ARARs are presented in Section 8.2 (Compliance with ARARs) and Section 9.0 (Selected Remedy and Performance Standards).

10.3 Cost-Effectiveness

Section 300.430(f)(1)(ii)(D) of the NCP, 40 C.F.R. § 300.430 (f)(1)(ii)(D), requires EPA to evaluate cost-effectiveness by first determining if the alternative satisfies the threshold criteria: protection of human health and the environment and compliance with ARARs. The effectiveness of the alternative is then determined by evaluating the following three of the five balancing criteria: long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, and short-term effectiveness. EPA has determined that the selected remedies for Pond 5 and Pond 6 satisfy the threshold criteria and most effectively address the contaminated soil/waste material. The estimated present worth costs are \$30,471,000 to \$33,396,000 for Pond 5 and \$6,408,113 for Pond 6. The Pond 5 costs are presented as a range since the specifications of the ground water interceptor system and the total capping area have not been defined. The selected remedies for Ponds 5 and 6 are cost effective because their costs are proportional to their overall effectiveness.

10.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to Maximum Extent Practicable

Pond 5 EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and alternative treatment technologies can be utilized in a cost-effective manner at Ponds 5 and 6. The ground water treatment system (Pond 5 Treatment Facility) will significantly reduce the mercury concentration in the ground water collected at the Pond 5 decant structure. To address Pond 5 soils/waste through alternative treatment technologies, several technologies were evaluated. In-situ stabilization treatment was carried through for detailed evaluation; however, this technology would not achieve greater overall remedial protection for the added costs.

Pond 6 The selected remedy does not include treatment technologies. The monitoring data collected at the Pond 6 decant structure indicates non-detectable concentrations of mercury, indicating that the mercury contained in the Pond 6 waste material does not appear to be mobile. As a protective measure, monitoring will be continued at the Pond 6 decant structure and a monitoring well will be installed directly downgradient of the suspected source material (i.e., the Former Chlorine Plant Site debris buried in the Pond 6 area) to provide early detection of mercury migration toward the river. Although treatment alternatives were evaluated for Pond 6, they were screened out since they would not achieve greater overall remedial protection for the added costs.

10.5 Preference for Treatment as a Principal Element

Pond 5 The selected remedy for Pond 5 utilizes treatment for the Pond 5 groundwater flow collected at the Pond 5 decant structure and conveyed to the Pond 5 Treatment Facility. The ground water will be treated to reduce mercury levels such that the treated water complies with acceptable levels established by the VDEQ Water Division. The remaining components of the Pond 5 selected remedy do not utilize treatment technologies. This is primarily due to the moderate levels of mercury found throughout the Pond 5 waste material coupled with the extremely large volume of waste material within Pond 5 (approximately 76 acres).

Pond 6 There are no treatment technologies identified in the Pond 6 selected remedy. As discussed in Section 10.4, above, the monitoring data collected at the Pond 6 decant-structure indicates non-detectable concentrations of mercury, indicating that the mercury contained in the Pond 6 waste material does not appear to be mobile. Moreover, as in Pond 5, the sampling of the waste material conducted throughout the Pond 6 area (surface to 10 foot depth) indicates that there are relatively low level mercury concentrations found throughout the large volume of waste material in Pond 6 (approximately 45 acres).

11.0 DOCUMENTATION OF SIGNIFICANT CHANGES

EPA issued the Proposed Remedial Action Plan for OU2 of the Saltville Waste Disposal Ponds Site for public review and comment on January 18, 1995. EPA's review of all written and verbal comments received during the comment period has resulted in significant changes to the preferred alternatives for the Former Chlorine Plant Site and Pond 6 areas.

Because of the high concentrations of mercury found in the soil at the Former Chlorine Plant Site area and

the potential for this mercury to migrate to and impact the river, EPA's preferred alternative for this area in the Proposed Remedial Action Plan called for permanent treatment of this source material via a thermal process known as retorting. This process would provide a permanent long-term solution for the Former Chlorine Plant Site area of the Site. During the public comment period, EPA received significant adverse comments on the retorting process identified in the preferred alternative for the Former Chlorine Plant Site. EPA has considered these comments and decided to defer the remedy selection decision for this area until additional data can be collected.

As noted in Section 9.0 of this ROD, the uncertainty of whether mercury is migrating to the river from the Former Chlorine Plant Site necessitates additional characterization of the impact of mercury contamination in this area. Additional investigation will be conducted concurrently with the ongoing study of the North Fork of the Holston River under Operable Unit 3. A Proposed Remedial Action Plan for Operable Unit 3, documenting the EPA preferred alternative for remedial action for the North Fork of the Holston River, will also include a preferred alternative for the remedial action for the Former Chlorine Plant Site.

With regard to Pond 6, the selected remedy has been changed from the preferred alternative documented in the Proposed Remedial Action Plan. The preferred alternative was identified in the Proposed Remedial Action Plan as Alternative P6D from the FS Report. The primary components of this alternative consisted of a permeable cover over the entire Pond 6 area, a system to neutralize the outfall at the Pond 6 decant structure, and localized containment of the buried demolition debris in the northeastern end of Pond 6 with vertical barrier walls and a RCRA Subtitle C compliant cap. The selected remedy in this ROD is not Alternative P6D, but a combination of Alternatives P6C and P6D, which were evaluated in the Proposed Remedial Action Plan. The selected remedy for this area as set forth in this ROD provides that the localized containment of the demolition debris with vertical barrier walls and a RCRA Subtitle C compliant cap (over the buried debris area) will be implemented only if monitoring of the ground water in Pond 6 downgradient of the buried debris indicates mercury is migrating to the river. In essence, the isolation of the buried debris has become a contingency component of the selected remedy for Pond 6, subject to ground water monitoring results.

One or more ground water monitoring wells will be installed in Pond 6 downgradient of the buried debris for the purpose of detecting any mercury that may be migrating toward the Pond 6 decant structure and ultimately discharging into the North Fork of the Holston River. The location of the monitoring well(s), the appropriate screening interval(s), and the frequency of sampling will be determined during remedial design.

EPA believes that the existing Site data is not conclusive regarding the issue of mercury contamination migrating from the buried debris in Pond 6. No existing ground water monitoring wells are located directly downgradient of the buried debris. As a result, EPA has selected remedy for Pond 6 that is fully protective of human health and the environment, meets ARARs, and allows for supplemental remedial action predicated upon ground water monitoring.

The Pond 6 preferred alternative in the Proposed Remedial Action Plan also stated that the remedy would be upgraded to include a RCRA Subtitle C compliant cap over the entire Pond 6 area and surface water management controls should monitoring indicate migration of mercury from Pond 6 at unacceptable levels. The selected remedy for Pond 6 set forth in this ROD does not include this provision. The selected remedy requires that long-term monitoring be conducted to detect migration of mercury to the North Fork of the Holston River. If unacceptable levels of mercury migration are detected, the need for supplemental remedial actions will be evaluated at that time based on the new information.

RECORD OF DECISION
SALTVILLE WASTE DISPOSAL PONDS SUPERFUND SITE

PART III - RESPONSIVENESS SUMMARY

This Responsiveness Summary documents public comments expressed to EPA on the Proposed Remedial Action Plan for Operable Unit 2 ("OU2") of the Saltville Waste Disposal Ponds Superfund Site ("Site") and EPA's responses to those comments. The information is organized as follows:

- A. Overview
- B. Comments Received During the Public Meeting
- C. Written Comments Received from Olin Corporation
- D. Written Comments Received from Other Citizens

A. OVERVIEW

EPA held a public comment period from January 18, 1995 through March 20, 1995, to receive comments from the public on the Remedial Investigation and Feasibility Study ("RI/FS") reports and the Proposed Remedial Action Plan ("Proposed Plan") for OU2 of the Saltville Waste Disposal Ponds Superfund Site. EPA held a public meeting on February 1, 1995, at 7:00 p.m. at the Northwood High School, in Saltville, Virginia. The public meeting was attended by EPA and VDEQ staff, local residents, representatives and consultants of Olin Corporation, public officials, and members of the press. The transcript of the public meeting is in the Administrative Record for the Site.

The purpose of the meeting was to present and discuss the findings of the RI/FS and to apprise the meeting participants of EPA's preferred remedial alternatives for OU2. Comments received during the meeting and written comments received throughout the public comment period are presented below along with EPA's response.

B. COMMENTS RECEIVED DURING THE PUBLIC MEETING

1. The Mayor of Saltville read a prepared statement announcing his appreciation of the cooperative relationships the Town of Saltville has achieved with EPA and other government agencies over the past few years, which has lead to significant accomplishments toward cleaning up the Site. The Mayor further stated concerns of many of the Saltville citizens with the retort process preferred by EPA for the Former Chlorine Plant Site area and questioned the need to disturb that area of the Site.

EPA Response: EPA appreciates the recognition by the Mayor of the efforts the Agency has made to work with the community to address the cleanup of the Site. As to the Former Chlorine Plant Site, EPA has carefully considered all the comments submitted by the public and determined that additional information is needed to make a decision on the cleanup in this area. In the Proposed Plan, EPA recommended treating the soils and sediments located at the Former Chlorine Plant Site based in part on the belief that the mercury present in these materials is migrating to the North Fork of the Holston River. The owner of the Site, Olin Corporation, and many in the local community believe that the mercury in the Former Chlorine Plant Site area is not migrating and/or can be readily contained.

Understanding and predicting how mercury contamination at the Former Chlorine Plant Site will migrate over time is difficult. During the RI/FS process, a model (i.e., mathematical equation) was used to estimate the migration of mercury to the river. This model relied on numerous assumptions in instances where appropriate data were not available. At this point, EPA is requiring that additional data be gathered to try to understand the migration process more clearly. Although this additional data will not allow EPA to predict future mercury migration with absolute certainty, EPA believes it will be in a better position to make a final determination on an appropriate remedy for the Former Chlorine Plant Site if it has the additional data. The Former Chlorine Plant Site will be addressed as part of Operable Unit 3 for the Site along with an evaluation of the North Fork of the Holston River.

A prepared statement was read at the public meeting by a representative of Olin Corporation ("Olin" or the "Company"), the potentially responsible party for the Site. The following comments summarize the issues raised by the Company on the Proposed Plan.

2. The Company contends that EPA's proposed alternatives for the Site were not included in the FS report, particularly EPA's preferred alternative for the Former Chlorine Plant Site calling for on-site retorting of contaminated soils and sediments. The Company therefore contends that the public was not given an adequate opportunity to understand the impacts of the retorting alternative.

EPA Response: The purpose of the RI/FI is to provide sufficient information to enable EPA to identify a preferred alternative. EPA is not required to use the information in the RI/FS reports in the exact format in which it is presented, particularly with regard to remedial alternatives. EPA often finds, as it did in this case, that, in the process of developing the Agency's preferred alternative, parts of various alternatives evaluated in the FS need to be combined to create what the Agency believes is the best alternative. As part of the Proposed Plan, EPA conducts a comparative analysis of the preferred alternative and the other alternatives considered in the Proposed Plan. The comparative analysis sets forth the Agency's reasoning for selecting the preferred alternative. This is what EPA did in the Proposed Plan for this Site.

For the on-site retorting alternative for the Former Chlorine Plant Site presented in the Proposed Plan, EPA used the information developed in the FS for Alternative P5L for Pond 5. This alternative included the use of on-site retorting to treat the mercury-contaminated waste in Pond 5. Alternative P5L was not retained as a final alternative for Pond 5 because of the high cost of treating the large volume of material in Pond 5; however, the retorting technology itself was not considered ineffective. The level of detail and analysis provided in the FS for retorting was similar to that provided for the other treatment alternatives evaluated.

In considering alternatives for the Proposed Plan, EPA determined that the FS provided sufficient information to develop an on-site retorting alternative for the Former Chlorine Plant Site. EPA supplemented the Administrative Record to show how the cost estimate for this alternative was developed. EPA believes that the Administrative Record available when the Proposed Plan was issued provided the public with sufficient information to evaluate all the alternatives proposed.

The Company's specific concerns with the retorting alternative have been carefully considered by EPA and, as addressed in the previous response, EPA is deferring a decision on the remedy for the Former Chlorine Plant Site until additional data can be collected.

NOTE: This Responsiveness Summary will not address additional specific comments made by the public on the preferred alternative for the Former Chlorine Plant Site since a remedy for that area of the Site is not part of this Record of Decision. Issues raised by the public about the remedy for the Former Chlorine Plant Site will be considered as this area is re-analyzed as part of Operable Unit 3. Upon conclusion of the RI/FS process for Operable Unit 3, EPA will issue a Proposed Remedial Action Plan identifying the Agency's preferred alternatives for the Former Chlorine Plant Site and the North Fork of the Holston River. At that time, the public will have the opportunity to comment on the Proposed Plan for Operable Unit 3 prior to EPA's selection of a final remedy for the Former Chlorine Plant Site and the North Fork of the Holston River. The remainder of this Responsiveness Summary will focus on comments relating to the Pond 5 and Pond 6 remedies.

3. The Company stated support for the construction of a cap over Pond 5. The Company contends, however, that EPA's addition of two feet of clay as a component of the cap would require transportation of 14,000 truck loads of clay through the community, resulting in noise, traffic congestion, possible accidents, and wear and tear on roads and bridges. In addition, the Company contends that using clay as a component of the cap would be technically impractical due to the physical characteristics of the Pond 5 waste material.

EPA Response: As to the Company's estimated number of truck loads of clay required, EPA does not have the basis for this estimate, which appears to be high. If the design process determines that clay is a necessary component of the multi-layered cap, EPA believes that this material could be transported safely through the community of Saltville. Regardless of whether a clay layer is specified for cap construction or not, disruptions such as those mentioned by the commentor may result from any type of construction. Developing specifications to minimize the disruptions, such as using the Pond 5 access road in lieu of the road through the community of Perryville, will be addressed during the remedial design process.

The selected remedy for Pond 5 includes construction of a multi-layered cap in accordance with RCRA Subtitle C requirements (40 C.F.R. Part 264, Subparts G and N) and VWMR § 10.13.K. These requirements provide the performance standards that the multi-layered cap must meet, but do not state how the cap must be designed to meet these performance standards. A two-foot clay layer is often a component of a multi-layered cap; however, if the performance standards can be met by using other components, EPA is not requiring the use of clay. The actual components of the multi-layered cap will be determined during the engineering remedial design process.

4. The Company stated support for covering Pond 6 with soil. The Company contends, however, that there is no potential that rainwater entering Pond 6 will carry mercury with it to the river.

EPA Response: Waste material was collected and analyzed for mercury at 30 sampling points in and around Pond 6 during the RI. The highest mercury concentration detected in Pond 6 was 78.3 mg/kg, and the average concentration across the Pond 6 was 20 mg/kg. Although mercury is typically not detected in the discharge at the Pond 6 outfall, low concentrations of mercury are occasionally reported. EPA does not believe the potential for mercury migration in Pond 6 can be determined based on the limited data available. Long-term monitoring for both Pond 5 and Pond 6 is required as part of the selected remedy to ensure that mercury contamination remains effectively contained within the pond areas.

5. The Company expressed concern with the component of EPA's preferred alternative for Pond 6 that requires isolation of the buried debris from the former chlorine plant. The Company stated that the isolation of the buried debris is overly protective and unnecessary.

EPA Response: EPA is concerned that the debris buried in Pond 6 contains elevated mercury concentrations and ground water in the area of the debris shows elevated mercury levels. The preferred alternative for Pond 6 in the Proposed Plan included isolation of this buried debris by capping and installing a vertical barrier wall around the debris area. After considering the comments from the Company and the public on isolation of the buried debris, EPA concluded that mercury migration in Pond 6 cannot be determined based on the limited data available. As a result, EPA decided to revise the Proposed Plan preferred alternative for Pond 6 when selecting the remedy for Pond 6 in the ROD. The Pond 6 remedy selected in the ROD requires the isolation measures only if additional data from monitoring in the vicinity of the buried debris shows that mercury contamination at unacceptable levels is migrating through the ground water to the river.

C. WRITTEN COMMENTS FROM OLIN CORPORATION

The following comments are those submitted in writing by the potentially responsible party during the comment period. Any comments addressed in the previous section are not repeated here. Again, as noted above, comments relating to the Former Chlorine Plant Site have not been included because this ROD does not select a remedy for that area of the Site.

1. The Company contends that the Pond 5 Treatment Facility does not need to be upgraded. The Company believes that the existing plant is capable of reducing the mercury concentration to a level that would cause the effluent from the Pond 5 Treatment Facility to be in compliance with the current Virginia surface water standards.

EPA Response: The existing Pond 5 Treatment Facility was constructed as required under the Operable Unit One (OU1) Interim Remedial Measures ROD, issued on June 30, 1987. At that time, the promulgated Virginia surface water standard for chronic toxicity of mercury in freshwater was 0.05 :g/l. The allowable concentration of mercury in the Pond 5 Treatment Facility effluent was stated in the OU1 ROD as 20 :g/l, based on the existing surface water standard. The current promulgated Virginia surface water standard for chronic toxicity of mercury in freshwater is 0.012 :g/l. The remedy selected in this ROD includes continued operation and maintenance of the Pond 5 Treatment Facility and, therefore, the current standard is an applicable or relevant and appropriate requirement ("ARAR"). The allowable concentration of mercury in the Pond 5 Treatment Facility effluent will be revised by the VDEQ Water Division and will be based on the current Virginia surface water standard in conjunction with various other factors.

EPA agrees that the available monitoring data collected from the Pond 5 Treatment Facility effluent reveals that mercury concentrations are significantly below the 20 :g/l discharge limit. However, EPA cannot determine if the present discharge from the Pond 5 Treatment Facility is in compliance with the current Virginia surface water standard for mercury because that revised discharge limit has not yet been established by the VDEQ Water Division. The revised discharge limit will be determined during the design process and EPA will evaluate the available data to determine the need for Pond 5 Treatment Facility upgrades at that time.

2. The Company contends that the material from Olin's former chlorine plant operation was a wastewater rather than a sludge and, therefore, was not regulated as a listed waste under RCRA. The Company further contends that the waste constituents are mainly calcium carbonate, calcium chloride, sodium carbonate, and sodium chloride, which are components of ammonium soda ash found in Ponds 5 and 6, and are not hazardous.

EPA Response: As a matter of policy, EPA has consistently stated that while certain wastewaters may not be subject to RCRA, such wastewaters can generate sludges that will meet the listing definition for hazardous waste under RCRA. Historically, EPA has regulated sludges that are removed from wastewater treatment unit tanks and impoundments or left in place in impoundments under RCRA. However, if wastewater which is a RCRA listed waste is discharged to a unit, then any material that did not pass through the unit, but instead settled, precipitated, or remained after evaporation, would be a sludge. Many facilities had "finishing" ponds that would sequentially allow more materials to settle out prior to discharge, and these materials, even if from non-listed wastewaters, became sludges that were listed hazardous wastes under RCRA.

EPA requires the material in Ponds 5 and 6 to be regulated as a K106 listed hazardous waste under RCRA. K106 listed hazardous waste is wastewater treatment sludge from the mercury cell process in chlorine production. The presence of mercury in the wastes in Ponds 5 and 6 has been clearly documented. Soda ash is a main constituent of the K106 listing, as are some of the other components identified in the Company's comment. However, K106 is listed solely for the toxic constituent mercury.

3. The Company contends that RCRA regulations do not apply retroactively, and RCRA cannot be considered an ARAR for the Pond 5 activities.

EPA Response: The issue of retroactive application of RCRA applies to actions that involve excavation or reprocessing of wastes that were disposed of prior to the enactment of RCRA. If a waste would be considered a RCRA listed hazardous waste today, but was disposed of before 1980 when RCRA was enacted, EPA requires that the waste still be regulated as a RCRA listed waste if the waste is being placed in another location or regenerated in some manner. EPA's position has been upheld by several court decisions. (The First Third LDR Rule published on August 17, 1988, in the Federal Register at 53 Fed. Reg. 31147, provides further background.) The remedy selected for Pond 5 will require excavation to regrade the waste material in order to appropriately install the multi-layered cap. Therefore, EPA is requiring that RCRA be applied retroactively to management of the waste in Pond 5.

4. The Company contends that RCRA is not an applicable or relevant and appropriate requirement for the multi-layered cap proposed in the remedy for Pond 5.

EPA Response: As discussed in Comment 2., above, EPA believes the waste in Pond 3 can be characterized as K106 listed hazardous waste under RCRA. Therefore, RCRA can be considered applicable to the remedy requirements for Pond 5. Even if some question existed as to whether the RCRA K106 listed hazardous waste classification was directly applicable, EPA would consider RCRA to be relevant and appropriate. EPA OSWER Directive 9234.2-04FS, entitled "RCRA ARARs: Focus on Closure Requirements" (October 1989), clearly indicates that where a cap is part of the remedy and the waste, even if not RCRA waste, is similar in nature to a RCRA waste, the cap should meet the substantive requirements of RCRA. The Company itself identified the RCRA regulations at 40 C.F.R. 264, Subpart G - Closure and Post-Closure, as an action-specific ARAR in the Feasibility Study ("FS") report.

5. The Company contends that long-term effectiveness, short-term effectiveness, and reduction of toxicity, mobility or volume through treatment are satisfied to the/same degree by Alternatives P5F and P5F-X. Overall, the Company contends that the comparative analysis reveals that Alternative P5F, the company's preferred alternative, represents a better balance of the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP") criteria than alternative P5F-X.

EPA Response: The primary differences between these alternatives are that Alternative P5F-X requires that the cap for Pond 5 comply with the requirements for closure under RCRA Subtitle C and that the existing Pond 5 Treatment Facility comply with the current Virginia surface water standard, while Alternative P5F does not.

One of the threshold criteria that the NCP establishes is compliance with ARARs. Alternatives that do not meet this criterion, or are not protective of human health and the environment, are not evaluated further. If the multi-layered cap described in Alternative P5F is determined to be in compliance with RCRA Subtitle C and if the existing Pond 5 Treatment Facility effluent is determined to be in compliance with the current Virginia surface water standard for mercury, these two alternatives are essentially the same. However, the information needed to make these determinations is not currently available. EPA modified

Alternative P5F by incorporating the necessary ARARs, thereby creating Alternative P5F-X. These modifications ensure that the alternative meets the threshold criterion requiring compliance with ARARs.

As to the criteria for long-term effectiveness, short-term effectiveness, and reduction of toxicity, mobility or volume through treatment, Alternative P5F would not be as effective in meeting the criteria because Alternative P5F does not include upgrades to the Pond 5 Treatment Facility to comply with the current Virginia surface water standard for mercury and does not require a RCRA Subtitle C compliant cap.

6. The Company contends that Alternative P6D (EPAs preferred alternative for Pond 6 in the Proposed Plan) and Alternative P6D-1 (a contingent action to be implemented at Pond 6 if monitoring indicates migration of mercury from Pond 6 in unacceptable levels) do not increase overall protection of human health and the environment more than other less costly alternatives.

EPA Response: EPA agrees that existing data do not currently support the need to implement the vertical barrier walls and RCRA Subtitle C compliant cap over the buried debris area, components which are included in Alternatives P6D and P6D-1 for Pond 6. Mercury is typically not detected in the discharge at the Pond 6 decant structure outfall. However, EPA also recognizes that effective long-term monitoring of Pond 6, particularly in the area of the buried debris, must be implemented to ensure that mercury contamination in Pond 6 is being properly contained. After reviewing comments received during the public comment period and re-evaluating the existing data, EPA decided not to select the Pond 6 preferred alternative set forth in the Proposed Plan (Alternative P6D, with P6D-1 as a contingent action) as the selected remedy for Pond 6. The selected remedy for Pond 6 in the ROD is Alternative P6C (Permeable Soil Cover), with a contingency to install the additional components of Alternative P6D for isolation of the buried debris if monitoring data indicates that unacceptable levels of mercury are migrating toward the river. If the contingent remedial action must be implemented, isolation of the buried debris would be accomplished with a vertical barrier wall around the buried debris and a cap over the buried debris area that complies with RCRA Subtitle C and VHWMR § 10.13.K.

7. As with Pond 5, the Company contends that RCRA is not an appropriate ARAR for Pond 6.

EPA Response: See responses to Comments C.2, C.3, and C.6, above.

8. The Company contends that EPA failed to follow its own guidance documents regarding oversight of a PRP conducting a RI/FS. Specifically, the Company believes it should have been given the opportunity to develop and evaluate the alternatives that EPA wanted to include in the Proposed Plan since the Company was performing the RI/FS.

EPA Response: As discussed in the response to Comment B.2, EPA often finds during the process of developing a Proposed Plan that components of several alternatives set forth in the FS report should be combined to address the problems at a site. EPA does not typically allow the potentially responsible party ("PRP") who has prepared the RI/FS report the opportunity to revise the document again to include EPA's preferred alternative, particularly if all the components of the preferred alternative are discussed in the FS report (albeit not necessarily set forth as a single alternative) and sufficient information is available to allow an evaluation. Revisions generally result in substantial delay. Therefore, if EPA has sufficient information in the FS report, as it believes it did in this case, the preference is to proceed with preparation of the Proposed Plan and not require additional document revisions after EPA has reviewed the RI/FS and decided on a preferred alternative. The appropriate forum for the PRP to comment on EPA's preferred alternative is during the formal public comment period, not through the less formal document revision process. This approach is consistent with Agency policy and guidance and with the NCP.

Over an approximate two-year period beginning in December 1992, the Company submitted four versions of the FS report for Operable Unit 2 Of the Site. EPA's comments on the draft documents focused primarily on the Company's need to include a full range of alternatives for remediation of the Site, not just those the Company thought were appropriate. This was a particular concern with regard to the Former Chlorine Plant Site. After the third submission in February 1994, EPA determined that sufficient information was available for the Agency to proceed with development of its preferred alternatives. EPA believed that any further request for the Company to expand the range of alternatives in the FS would not yield productive results and would lead to unnecessary delay. Final revisions, as requested by EPA, were made and the final FS report was submitted in January 1995. The final revisions involved removing references to the ecological risk assessment which is being conducted as part of Operable Unit 3.

EPA believes that the appropriate level of oversight of the Company was provided during preparation of the

RI/FS. EPA further believes that the process followed in preparing the Proposed Plan was not only appropriate, but necessary to achieve fair and open public input into the remedy selection process.

D. WRITTEN COMMENTS FROM OTHER CITIZENS

1. EPA received three hundred fifty-five signatures on several petitions which stated the following:

It is better to leave the Former Chlorine Plant Site undisturbed than to excavate contaminated soil. Mercury discharge from this Site is minimal and can be controlled by Olin's alternative.

It is better not to place a heavy cap on Pond 5 since it may settle and not perform as needed.

It is better to minimize truck traffic and other disruptions to the community, and Olin's alternatives do this.

It is hoped that Pond 6 can be preserved for future feasible and possible constructive uses.

EPA Response: The first element of the Petition was addressed in EPA's response to Comment B.1, above, and the second and third elements were addressed in EPA's response to Comment B.3, above. With regard to the preservation of Pond 6 for future feasible and possible constructive uses, EPA believes that the physical behavior of the Pond 6 waste material is likely to be a more limiting factor than the mercury contamination. EPA believes the final remedy adequately addresses the risk presented by the Site and protects human health and the environment. EPA further believes that restoring the Pond 6 area for constructive use may require measures beyond those required under this ROD.

2. Several citizens expressed concern that Olin has spent more than 20 million dollars on the Site and that EPA is going to extremes by requiring additional remedial actions and expense.

EPA Response: EPA believes that selected remedial actions are necessary to address the risk to human health presented by the Site. In addition, EPA believes that the remedies selected in this ROD provide an appropriate balance among the nine criteria the Agency is required to consider in selecting an appropriate remedy for a Superfund site. Cost effectiveness is among the criteria evaluated.

3. One commentator stated that money is not being spent wisely for the problems of the Site, and any additional expenditures should be spent where it can do the most good for all citizens of the Saltville area. On this topic, another commentator noted that "[t]his is a pure example of waste of money when our area could use money for medical benefits, educational benefits and recreational benefits for our youth." Another commentator noted that spending millions on the "Muck Ponds" would not help the citizens of Saltville or future generations.

EPA Response: Under the Superfund program, EPA is responsible for protecting human health and the environment. EPA believes that efforts being taken through this ROD to control the release of mercury at the site will benefit future generations in Saltville by protecting human health and the environment.

4. One commentator stated that the weight of a thick cap on Pond 5 would cause problems and that a lighter cap would be better on the soft muck. Several commentators also stated that adding top soil to Ponds 5 and 6 would help those areas.

EPA Response: As stated in the response to Comment B.3, above, EPA is requiring that the multi-layered cap constructed over Pond 5 comply with RCRA Subtitle C and VHWMR § 10.13.K requirements. These requirements establish the performance standards that the cap must meet (e.g., the cap must be less permeable than any bottom liner system or natural subsoils present), but do not specify details such as the thickness of the cap or materials to be used. The details are determined during the engineering design process. The physical behavior and characteristics of the pond waste material will need to be considered during the design process to determine the appropriate components of the multi-layered cap. Top soil and vegetation will be included as components of both the Pond 5 cap and the Pond 6 permeable soil cover.

5. The Commonwealth of Virginia, Office of the Governor, expressed concern that many elements of EPA's

preferred alternatives do not recognize the findings of the extensive Site investigation and FS undertaken by Olin Corporation with the consent and supervision of EPA and VDEQ.

EPA Response: As discussed in the responses to Comments B.2 and C.8, above, EPA believes the alternatives presented in the Proposed Plan were based on information developed during the RI/FS process. EPA and VDEQ were closely involved with the oversight of the RI/FS conducted by the Company. To the extent possible, the information used in developing the preferred alternatives, including the technologies, costs, and implementation schedules, were derived from the RI/FS. EPA produced an independent cost estimate for the preferred alternatives set forth in the Proposed Plan to adjust for cost of a RCRA Subtitle C compliant cap, as called for in the preferred alternatives (i.e., covering all of Pond 5 in Alternative P5F-X and covering the buried debris area in Alternative P6D). These cost estimates were entered into the Administrative Record to supplement the cost information contained in the OU2 FS report. EPA has revised its preferred alternatives set forth in the Proposed Plan and has selected final remedies for Ponds 5 and 6 in this ROD after considering new information and concerns from the citizens of the community and other members of the public. In essence, the public participation process has worked as intended under the NCP.

6. One commentator questioned why the calculation of non-carcinogenic risk from the Site based on current conditions does not consider operation of the recently in, trailed Pond 5 Treatment Facility.

EPA Response: In accordance with EPA guidance, risk is calculated based on analytical data that reflects existing conditions. EPA agrees that the Pond 5 Treatment Facility will effectively reduce discharge of mercury to the river, but risk is not calculated based on potential future improvements in water and sediment quality. This approach is used because of the difficulties that exist in predicting future environmental conditions. For example, the water and sediment quality in the river are influenced by factors other than the effluent from the Pond 5 Treatment Facility. Factors such as sediment contamination from historical deposition of mercury and possible mercury-contaminated seepage through the pond dikes need to be considered.

The Baseline Risk Assessment conducted for the Site found that individuals coming in direct contact with river water and sediment do not face an unacceptable risk. Eating fish caught in the river, on the other hand, does pose an unacceptable risk. Because mercury is very persistent in the environment, the levels currently present in aquatic organisms are expected to remain for a long time. EPA is requiring long-term monitoring as part of this remedy and additional assessment of the river will be performed as part of the Operable Unit 3 RI/FS process.

7. One commentator questioned why the RI/FS expects residents to violate 44 times each year the fish consumption ban issued for the river.

EPA Response: A fish consumption rate of 9,855 grams per year (i.e., the equivalent of two meals of fish per month) was used in the Baseline Risk Assessment. This value is approximately one-half the EPA Superfund default value for fish consumption. EPA allowed a reduction in the consumption rate to be used in the Baseline Risk Assessment in part because of the fish consumption ban. Compliance with fishing bans is difficult to monitor and EPA does not believe that it is reasonable to assume that no one eats fish from the river. EPA uses conservative assumptions for the exposure parameters since these values represent the reasonable maximum exposure (RME) that an individual could be expected to encounter. The RME is defined as the highest exposure that is reasonably expected to occur at a site. The intent of the RME is to estimate a conservative exposure case (i.e., well above the average case) that is still within the range of possible exposures. Uncertainty is evaluated under this approach.

8. One commentator recommended that EPA recalculate the hazard indices assuming that the existing fences and clay cover on the Former Chlorine Plant Site would be maintained. The commentator contends that tax dollars could be better spent elsewhere if the evaluation under these scenarios resulted in hazard indices of less than one.

EPA Response: The purpose of the Baseline Risk Assessment is to evaluate the risk if no action is taken to address the problems at a site. If no unacceptable risks exist under such a scenario, EPA would not require any cleanup action. If the Baseline Risk Assessment indicates that a site can potentially pose an unacceptable risk, alternatives are evaluated to determine the best way to prevent that unacceptable risk from occurring. Maintenance of fences and clay covers are actions that could be considered as an alternative for addressing site risks, however, these actions should not be assumed to occur for the purpose of calculating the Hazard Indices in the Baseline Risk Assessment.

9. One commentator suggested the EPA provide calculations of incremental risk reduction based on projected dollar expenditures for each alternative discussed in the Proposed Plan (e.g., calculate the decrease in the

Hazard Index and increase in projected cost for Pond 5 if a RCRA cap versus a synthetic liner is installed).

EPA Here: EPA agrees that such calculations would be beneficial if they could be made. Unfortunately, the environmental results of specific cleanup actions can rarely be quantified precisely enough to perform this type of calculation. In the example cited, a RCRA multi-layered cap is designed to provide several degrees of protection in the event any one component of the cap fails. Typically, a synthetic liner is one of the components of a RCRA cap. If the synthetic liner is punctured or deteriorates over time, other components of the remedy serve as a back up system to ensure cap failure does not occur. If a synthetic liner is used alone without any additional components, the risk of cap failure increases.

The purpose of the nine criteria used by EPA to evaluate alternatives is to provide a qualitative assessment of the tradeoffs that occur with various cleanup alternatives. To continue the above example, the RCRA cap would be considered to provide a greater degree of long-term effectiveness and permanence than the synthetic liner. On the other hand, the synthetic liner will be less expensive. The two threshold criteria which must be met for an alternative to be considered as viable are (1) protection of human health and the environment, and (2) compliance with ARARs. RCRA Subtitle C and VHWMR § 10.13.K are ARARs for Pond 5 and, therefore, the cap to be constructed must be in compliance with RCRA Subtitle C in order to satisfy the threshold criteria of compliance with ARARs.

10. One commentor questioned why there is a need for a cap over Pond 5 or Pond 6 since there is a ground water recovery and treatment system.

EPA Response: The waste material in Ponds 5 and 6 has the potential to pose an unacceptable health risk to individuals who come in direct contact with the material. The cap on Pond 5 and the permeable soil cover on Pond 6 will address the risk exposure pathway of dermal contact. The purpose of the ground water recovery and treatment system is to reduce the mercury concentration in ground water from Pond 5 collected at the decant structure to an acceptable level before it is discharged to the river. The ground water recovery and treatment system does not eliminate exposure to individuals that can occur by direct contact with the surface of the waste material. The multi-layered cap required for Pond 5 and the soil cover required for Pond 6 will eliminate this exposure pathway.

11. One commentor stated the there was no analysis in the published reports to model the time and expense of treating ground water for the ponds with and without a cap.

EPA Response: As discussed in the response to Comment D.9 above, the ability to reliably predict the specific environmental results of cleanup actions (e.g., the rate that pollutants can be removed from the ground water) is difficult. Currently, rainwater that falls on Pond 5 moves down through the waste material and comes in contact with the mercury contamination. As a result, the water transports the mercury through the waste material and eventually to the decant structure where it is collected for treatment By the Pond 5 Treatment Facility. By placing a multi-layered cap over Pond 5, rain water will no longer move into the waste material and transport the mercury to the decant structure. Therefore, if a cap is installed on Pond 5, the expense of treating mercury-contaminated water will be reduced. Any modeling to predict the reduction in the level of mercury in the ground water or the decrease in treatment expense, with or without a cap, would rely heavily on assumptions. These assumptions would include, but not be limited to, total quantity of mercury contained in the ponds, flow rates, mercury removal rates, treatment plant efficiency, and the overall effectiveness of capping. EPA does not believe that such an analysis would have contributed any substantial information to the decision-making process.

12. One commentor stated overall support for the EPA preferred alternatives but questioned how EPA will monitor the clean-up process.

EPA Response: EPA or an EPA contractor will maintain a field presence at the Site to document remedial actions and ensure all performance standards of the selected remedies are achieved.

Section 300.430(f)(4)(ii) of the National Contingency Plan (NCP) states that:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.

EPA will conduct five-year reviews to evaluate whether the response action remains protective of human health and the environment. If protectiveness is being ensured by eliminating the exposure pathways, as is the case in Pond 5 with containment by capping, the Pond 5 Treatment Facility, and institutional controls, and in Pond 6 by the permeable soil cover and institutional controls, then the review should focus on whether the cap remains effective, the treatment plant is operational and functional, and the controls remain in place.

Under CERCLA, EPA may terminate statutory five-year reviews when no hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unrestricted use and unlimited exposure. Reviews should be discontinued only if appropriate monitoring shows that contamination levels have been reduced to allow for unrestricted use of the site. Reviews should be continued if requirements promulgated or modified after signature of the ROD result in a determination that the remedy is no longer protective.

13. Several citizens supported EPA's preferred alternatives, but stated that taxpayers' dollars should not be used to pay for the cleanup.

EPA Response: If the potentially responsible party does not agree to implement the remedy selected in this ROD, EPA will use Superfund money to pay for the cleanup. Superfund money comes mainly from taxes on the chemical and petroleum industries, not from general taxpayers' dollars

14. Several citizens, while supporting the EPA preferred alternatives, voiced concern about the health of the children of Saltville and the future generations impacted by the Site and other contamination in the Saltville area.

EPA Response: EPA believes the containment remedies selected for Ponds 5 and 6 will be protective of children since the risk exposure pathways are eliminated. Also, as stated in the response to Comment D.12, above, if hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure, EPA is required to conduct site-wide five-year reviews to verify that the implemented remedies are effective and will remain effective in providing protection for future generations.

When contamination has been identified outside the limits of the Superfund National Priorities List ("NPL") Site at Saltville, EPA has conducted investigations and removal actions, when necessary, to address the problem. Removal actions have been and/or are being conducted at the power plant site, graveyard dump site, and new bridge area. EPA will continue to conduct these removal actions whenever appropriate in addition to the remedial cleanup process at the Superfund NPL Site.

15. One commentor questioned whether the mercury contamination in the North Fork of the Holston River could affect their livestock and poultry that drink from the river downstream from the Site, or family members who drank water from a well located approximately 150 feet from the river.

EPA Response: EPA has no data to indicate that mercury contamination has impacted ground water (i.e., the water that would be found in a well) downstream from the Site. The data from the Remedial Investigation ("RI") indicates that the shallow ground water is contaminated in isolated areas with elevated mercury levels greater than the Maximum Contaminant Level ("MCL") of 2 ug/l. The majority of the ground water monitoring results indicate low level (at or slightly exceeding the MCL) to non-detectable mercury concentrations at the Pond 5 and Pond 6 areas of the Site. An MCL is defined as the maximum permissible level of a contaminant in water which is delivered to any user of a public water system.

The data does not suggest that the contaminated shallow ground water would flow parallel to the river for any significant distance, resulting in migration outside the Site area in a direction to the west and east of the Site boundary. Rather, the data indicates that shallow ground water flows and discharges to the North Fork of the Holston River, generally to the south. Consequently, wells located outside the Site area, and not immediately adjacent to the Site are unlikely to be impacted with mercury contamination. In order to properly evaluate whether the commentor's residential well could be impacted with mercury from the Site, information regarding the well location and construction is needed. If anyone has continued concern about the quality of water in a well used for drinking water, EPA recommends that the local Board of Health be contacted.

A detailed investigation of the North Fork of the Holston River, including sampling of the surface water, sediment, and biota, is being conducted as part of Operable Unit Three ("OU3") of the Site. Since that study has not yet been completed, EPA has not yet reached any conclusions regarding the quality of the surface

water or sediment in the river downstream from the Site. It should be noted that there currently is a ban against the consumption of fish from the river. EPA will make the findings of the RI/FS for OU3 available to the community when it is completed in approximately one year.

16. One citizen stated that EPA's preferred alternatives are a good start, but voiced concern that there is contamination in places other than Ponds 5 and 6.

EPA Response: Evidence or knowledge of contamination outside the limits of the Superfund NPL Site should be brought to the attention of the EPA Region III Office of Superfund or the Virginia Department of Environmental Quality, for an investigation. EPA's Superfund emergency response program has been investigating several areas in Saltville where hazardous substances allegedly have been disposed and will continue to do so if information becomes available.

17. One citizen asked how long it will take to flush out the contaminants from the Site.

EPA Response: As discussed in the responses to Comments D.9 and D.11, the ability to reliably predict the environmental results of cleanup actions is limited. With respect to Ponds 5 and 6, significant movement of mercury has only been detected at Pond 5. The purpose of the cleanup actions for Pond 5 is to contain the mercury in place, not "flush" the mercury out of the waste material. By effectively containing the waste material, the migration pathways for the mercury and the risk exposure pathways (e.g., dermal contact, ingestion, etc.) by which the contamination can spread and pose risk are reduced or eliminated. An interceptor system is also proposed as part of the containment system for Pond 5 to collect and divert shallow ground water flow away from the pond. Long-term monitoring is required at both Pond 5 and Pond 6 to ensure mercury is not released to the river in the future.

18. One commentator asked what the schedule of events will be for the cleanup of the Site.

EPA Response: After issuance of this ROD, the potentially responsible party will be given the opportunity to negotiate a judicial consent decree with EPA and the United States Department of Justice to implement the remedy. This process normally requires six to nine months. The next phase of the project is remedial design, which is estimated to take 18 to 24 months to complete. Following EPA approval of the design, on-site construction will begin. EPA estimates that construction will require 4 to 7 years to complete.

19. One commentator asked how EPA determines the feasibility of long-term extracting and treating the ground water if the aquifer cannot be remediated.

EPA Response: In general, extraction and treatment technology can effectively remove hazardous constituents from ground water to acceptable levels. The problem with this technology is that, in many cases, the system will operate indefinitely because a continuing source of contamination exists. In these situations, this technology can stop the spread of ground water contamination, but cannot eliminate the source of the contamination itself. The length of time that a system needs to operate cannot be predicted with any degree of accuracy. A decision to stop operating the system could only be supported by monitoring data. Typically, an extraction and treatment system would be combined with other remedial technologies that attempt to treat or contain the source of the contamination, such as capping or interceptor trenches.

20. One commentator asked if age dating of ground water would be used to determine the source of the contamination.

EPA Response: EPA does not believe that age dating is necessary to identify the source of the ground water contamination. The RI has identified the sources of mercury contamination in the ground water beneath the ponds as the waste materials contained in the ponds. Mercury in the ponds originated in the electrolytic process that occurred at the former chlorine plant. Mercury cells were used as the cathode at the chlorine plant and some mercury was lost in the process. The mercury was passed to Pond 5 in the wastewater. Mercury has also been found in the waste at Pond 6, however, mercury is generally not detected in the discharge at the Pond 6 decant structure outfall. Olin believes that wastewater containing mercury may have been discharged into Pond 6 late in the operation of the chlorine plant. Olin believes that all of the wastewater containing mercury went to Pond 5 until at least 1969. Olin also believes that it is possible that weak brine pure discharge waters from the chlorine plant may have been used to help slurry the ammonia soda ash waste the long distance from the Solvay process plant (a process independent of the chlorine process) to Pond 6. EPA believes the current data sufficiently characterizes the source and does not believe that age dating would provide significant additional information.

Measuring naturally occurring or introduced elements which can be radioactive (such as tritium and Carbon 14)

can help determine the ground water recharge areas, ground water flow patterns and the age of ground water. Ground water age dating is not routinely performed at EPA Superfund site investigations since it would only provide interpretive information on ground water flow patterns. Ground water flow patterns are routinely evaluated during EPA studies through use of data from regional geologic publications and the installation and testing of monitoring wells. EPA's approach in identifying the Source of contamination at a site is basically to collect all historical data and direct soil, sediment and ground water sampling and chemical analysis to identify the source and its extent.

21. One commentor asked what compounds other than mercury were found in the aquifer.

EPA Response: Mercury is the primary contaminant of concern. Arsenic at slightly elevated levels was detected at the Former Chlorine Plant Site, but EPA believes this may be naturally occurring. Further sampling will be conducted to confirm the natural occurrence of arsenic. Section 5.2 in Part II of the ROD (Nature and Extent of Contamination in Ponds 5 and 6) discusses the contaminants detected during the RI.

22. One commentor asked what alternative would be proposed if ground water is contaminated at the Site.

EPA Response: The ground water at the Site is contaminated. The ground water characteristics are described in the RI/FS and summarized in Section 5.2 in Part II of the ROD. EPA's selected remedy for Pond 5 requires that contaminated ground water be collected in the Pond 5 decant structure and pumped to the existing Pond 5 Treatment Facility. This extraction and treatment system will reduce the concentrations of mercury in the Pond 5 ground water to acceptable levels prior to discharge to the river. The mercury concentration in the ground water at the Pond 6 decant structure is typically non-detectable, therefore, such ground water does not require treatment for removal of mercury. Long-term monitoring is required as part of the remedy to ensure that direct discharges to the river remain non-detectable.

23. One commentor asked how long it would take for the mercury to reach the fractures in the bedrock surface.

EPA Response: Mercury contamination in Ponds 5 and 6 is not expected to migrate to fractures in the bedrock surface. The bottom layer of Ponds 5 and 6 has been described as cemented alluvium which is a very tight geologic layer. The pathway for mercury migration at the ponds is toward the decant structures. Mercury has not been detected in any significant levels in bedrock wells at Pond 5 or Pond 6.

24. One commentor asked if the mercury has already migrated to the aquifer, and if so, whether it will remain there indefinitely as a deep contaminating source indefinitely.

EPA Response: Based on the monitoring well results, the shallow aquifer is contaminated with mercury at elevated levels in isolated areas where waste is in direct contact with the ground water. At Ponds 5 and 6, the deeper bedrock aquifer monitoring well results also detected contamination with mercury but at very low levels. The low concentrations of mercury detected in the bedrock aquifer do not support the potential of its occurrence as a source in the bedrock aquifer beneath the Pond 5 and Pond 6 areas of the Site. This may be due in part to the occurrence of the cemented alluvium directly beneath the majority of both Pond 5 and Pond 6, which would serve to prevent migration of mercury vertically to the bedrock aquifer. The water elevation data further suggest that the preferential shallow ground water flow path is in a lateral direction toward the decant structures. Long-term ground water monitoring is included in the selected remedies in order to provide EPA with data to ensure that the remedies chosen for Ponds 5 and 6 continue to be protective of human health and the environment. It is also important to note that further information will be gathered in the Former Chlorine Plant Site area of the Site to evaluate the extent of mercury contamination in the aquifer from sources at the Former Chlorine Plant Site.

25. One commentor asked if flow rates are available for ground water at the Site.

EPA Response: Aquifer tests such as packer testing and slug testing were performed at monitoring wells and borings in order to estimate the hydraulic conductivity of the alluvium, waste, and bedrock across the Site. The estimated geometric mean hydraulic conductivity values from each method for the bedrock aquifer and alluvium/fill are in the RI. The gradient of the water table and potentiometric surface of the bedrock aquifer was estimated in the RI as well as from several rounds of water elevation data. These data were used to estimate the average linear velocity of ground water flow in the bedrock aquifer and in the alluvium/fill. The average linear velocity during a high water elevation was estimated to range from 0.33 ft/day up to 3.2 ft/day for effective porosities of 1 percent, and 0.033 ft/day up to 0.32 ft/day for effective porosities of 10 percent. Calculations were also performed from data collected during low water

elevation period with the average linear velocity estimated range from 0.23 ft/day up to 3.5 ft/day assuming an effective porosity of 1 percent, and from 0.023 ft/day up to 0.35 ft/day assuming an effective porosity of 10 percent. For a more detailed explanation of how the average linear velocity estimates were derived, Section 5 of the OU2 RI report provides a more detailed explanation of the hydrogeologic properties. This report is available for your review in the information repository at the Smyth-Bland Regional Library, Saltville Branch.

26. One commentor asked what will happen if the Site cannot be fully remediated and whether we would accept that all sites cannot be remediated.

EPA Response: EPA believes the Saltville site can be effectively remediated. Due to the volume of waste, the low concentrations of mercury, and the physical characteristics (i.e., the dikes and decant structures) of the ponds, EPA believes that containment is an appropriate remedy for Ponds 5 and 6. Although containment leaves the waste in place, the goal of containment is to eliminate the pathways by which the contamination could spread and eliminate the exposure pathways. EPA believes that the selected remedies for Pond 5 and Pond 6 will be protective and remediate these areas of the Site.

27. The U.S. Department of the Interior stated that an ecological risk assessment has not been conducted for OU2, but is needed to determine whether implementation of the OU2 remedial alternatives will effectively eliminate ecological risk to terrestrial receptors at the Site. The U.S. Department of the Interior also stated that an ecological risk assessment is needed to determine whether implementation of any of the OU2 remedial alternatives would effectively and permanently eliminate future releases of mercury and associated ecological risk to aquatic receptors in the river.

EPA Response: A comprehensive ecological risk assessment for the entire Site is being conducted as part of the Operable Unit 3 RI/FS for the Site. EPA believes the remedy selected in this ROD is protective of terrestrial receptors at the Site. Both ponds will be covered to prevent wildlife from coming in direct contact with the waste material. In addition, discharge of mercury to the river will be reduced to levels that are consistent with the Virginia surface water standards for the protection of aquatic life. EPA recognizes that the presence of mercury contamination in the river from historical activities at the Site still results in an adverse impact on the river ecosystem. This impact, however, will be the focus of the comprehensive ecological risk assessment to be performed as part of Operable Unit 3.

28. The U.S. Department of the Interior asked why EPA has not consulted with the Fish and Wildlife Service with respect to the application of the Endangered Species Act to remedial action at the Site.

EPA Response: EPA has consulted with the Fish and Wildlife Service throughout the RI/FS process for this Site on an informal basis. EPA will conduct the formal consultation required under the Endangered Species Act during the remedial design phase of the project.

29. The U.S. Department of the Interior asked how the preferred alternatives for Ponds 5 and 6 would provide long-term isolation of source materials and risk reduction.

EPA Response: For Pond 5, the primary pathway for release of mercury into the river is ground water migration via the Pond 5 decant structure. All flow through the Pond 5 decant structure is now transferred to the Pond 5 Treatment Facility; therefore, the direct pathway for mercury migration to the river is eliminated and risk reduction is achieved. The mercury concentration at the Pond 6 decant structure is typically non-detectable, therefore, risk reduction is not necessary. Long-term monitoring is required as part of the remedy to ensure that direct discharges to the river remain non-detectable and in compliance with the remedy. Risk from contact with the mercury-contaminated waste materials in the ponds is reduced by construction of a RCRA multi-layered cap on Pond 5 and a permeable soil cover on Pond 6.

EPA believes that long-term isolation will be achieved by the selected remedies and will be ensured by the required long-term monitoring. Moreover, the statutory five-year review process will supplement the long-term monitoring to ensure the selected remedies are effective.

30. The U.S. Department of the Interior stated that if removing the mercury from Pond 5 and Pond 6 is not feasible, additional information should be provided in the ROD analyzing how the cap and Treatment Facility for Pond 5 and permeable soil cover for Pond 6 are expected to perform long-term under the unstable condition of the pond material, erosion, and flooding. The U.S. Department of the Interior further notes that contingencies should be included in the selected remedies to protect the environment and trust resources from structural or treatment failures of the selected remedies.

EPA Response: The performance of the components of the selected remedies relative to physical site characteristics, while maintaining compliance with ARARs, are technical/engineering matters that will be addressed in the remedial design phase of the project. As stated in the response to Comment D.29, above, long-term monitoring and statutory five-year reviews will supplement the selected remedies to ensure long-term effectiveness. Contingencies with respect to potential failure of specific aspects of the selected remedies will also be addressed during remedial design.

Potential structural failure of the existing Pond 5 dike is discussed in Section 3 of the OU2 RI report. The Pond 5 dike stability analysis in that section concludes that the dike is stable against large scale slope failure under current drained pond conditions. The analyses also indicated that the dike would be stable under flooded conditions and maximum credible earthquake loading.

With regard to potential failure of the Pond 5 Treatment Facility, EPA believes there is sufficient storage capacity with the existing 2 million gallon equalization pond and the capacity of Pond 5 itself to minimize the potential of untreated water being released to the North Fork of the Holston River.

31. The U.S. Department of the Interior stated that a combination of Alternatives P5F-X (the selected remedy) and P5J-1 would offer the highest degree of ecological protection, given the alternatives in the Proposed Plan.

EPA Response: EPA believes that the highest degree of ecological protection would be offered by the complete removal of all waste material from Pond 5 and Pond 6; however, this is not technically feasible due to the extremely large volume of material.

EPA further believes that implementation Alternatives P5F-X and P5J-1 is not cost-effective and does not provide a sufficient degree of additional risk reduction to warrant Supplementing Alternative P5F-X (the selected remedy) with the in-situ treatment technology described in Alternative P5J-1.

EPA maintains that the selected remedy for Pond 5, Alternative P5F-X, is protective of human health and the environment, complies with ARARs, and is the most appropriate remedy for Pond 5 when evaluated with respect to the nine selection criteria listed in the NCP.

32. The U.S. Department of the Interior stated that, with respect to the preferred alternative for Pond 6, the Proposed Plan does not explain what the unacceptable levels are for triggering the contingent remedial action for Pond 6 (a RCRA Subtitle C compliant cap over the entire Pond 6 area, instead of over just the buried debris area, and surface water management).

EPA Response: Although the preferred alternative for Pond 6 set forth in the Proposed Plan includes the contingent remedial action described in the comment, EPA revised the preferred alternative, including the contingent remedial action, in selecting the remedy for Pond 6 in this ROD. The contingent remedial action with respect to the selected remedy for Pond 6 in the ROD is isolation of the Former Chlorine Plant Site debris buried in the eastern end of Pond 6. As stated in Section 9.2.3(2) in Part II of the ROD:

Ground water modeling shall be conducted to estimate the concentration of mercury in a trigger well that could result in a discharge from the Pond 6 decant structure exceeding the Virginia surface water standard for mercury. Conservative assumptions shall be used in the model because of the uncertainties inherent in such calculations. EPA shall determine, based on this ground water modeling and any other information deemed appropriate, the mercury concentration (i.e., action level) which, if exceeded in any of the newly installed ground water monitoring wells and in a subsequent confirmatory sample, shall trigger implementation of the contingency actions to isolate the debris buried in Pond 6.

33. The U.S. Department of the Interior stated a preference for excavation and removal of the former chlorine plant debris buried in the eastern end of Pond 6, as opposed to isolation of the debris area which was included in the preferred alternative for Pond 6 in the Proposed Plan.

EPA Response: The currently available data is inconclusive regarding migration of mercury from the buried debris area of Pond 6. The selected remedy for Pond 6 includes isolation of the former chlorine plant debris buried in the eastern end of Pond 6 (using vertical barrier walls and a cap over the debris area that complies with the performance standards of RCRA Subtitle C and VHWMR §f 10.13.K) as a contingent remedial action for Pond 6. The contingent remedial action will be triggered if ground water monitoring indicates that mercury from the buried debris area is migrating to the river at unacceptable levels as discussed in Section 9.2.3 in Part II of the ROD. New wells will be installed in appropriate locations on Pond 6 to provide early detection of mercury migration from the buried debris area.

Since the data is inconclusive regarding the migration of mercury from the buried debris area, EPA believes that removal is not warranted and risk reduction is sufficiently addressed by dedicated monitoring of the buried debris area and the contingent remedial action.

34. The U.S. Department of the Interior stated that ground water monitoring wells should be installed to detect the movement of contaminants in the water leaving Ponds 5 and 6.

EPA Response: The selected remedies for Pond 5 and 6 do include ground water monitoring to detect the migration of mercury in Ponds 5 and 6. As stated in Section 9.3.1 in Part II of the ROD:

A long-term ground water monitoring program shall be implemented to evaluate subsurface flow conditions and water quality in the Pond 5 and Pond 6 areas, specifically the seepage of contaminated ground water migrating through the dikes to the river. The number of new wells, the exact location of new wells, and the associated screen depth of the new wells shall be approved by EPA during the remedial design. Supplemental sampling of existing onsite wells may be incorporated into the long-term monitoring program. Samples shall be collected and analyzed for mercury on a quarterly basis for a period of 30 years. The Pond 6 decant structure outfall shall be sampled and analyzed for mercury and pH quarterly for a period of 30 years.

35. The U.S. Department of the Interior questioned why measures to divert surface water runoff away from Pond 6 were not implemented for Pond 6 as they were for Pond 5.

EPA Response: At this point it is not deemed necessary to divert surface water runoff from entering Pond 6. Although the presence of mercury in Pond 6 has been established, there have not been significant concentrations of mercury measured at the Pond 6 decant structure outfall. The concentration of mercury in the Pond 6 outfall is usually non-detectable. Long-term monitoring of the Pond 6 decant structure outfall and dike areas will detect whether this changes in the future. Pond 6 ground water is believed to be an isolated flow system. Unlike Pond 5, fracture flow of ground water from Little Mountain does not appear to contribute to the Pond 6 hydrogeological system.

36. The U.S. Department of the Interior stated that the ROD should explain how the river environment will be monitored and what action will be taken to prevent or mitigate any adverse impacts to the river during implementation of the OU2 remedy. The U.S. Department of the Interior further recommends that sediment and surface water from the river be analyzed for mercury, supplemented by toxicity testing using sediment and surface water.

EPA Response: A determination of any adverse impacts to the river that will result from implementing the OU2 remedies will be made during remedial design. If it is determined that adverse impacts to the river will, in fact, occur as a result of implementing the OU2 remedies, then the action which must be taken to prevent or mitigate such impacts will also be determined during remedial design. General concerns regarding any erosion, storm water runoff, and fugitive dust that may result from implementation of the OU2 remedial actions will be addressed during the remedial design.

Surface water and sediment sampling of the North Fork of the Holston River has been conducted by Olin on a quarterly basis in the past and will continue. Fish collection has been conducted by Olin on an annual basis and will continue. An RI/FS for Operable Unit 3, including an ecological risk assessment, studying the impact of contamination on the river, is ongoing and anticipated to be completed in the summer of 1996.

SALTVILLE WASTE DISPOSAL AREAS OU2
ADMINISTRATIVE RECORD FILE *
INDEX OF DOCUMENTS

I. SITE IDENTIFICATION

1. Report: Investigation of Mercury Occurrence, Former Chlorine Plant Site. Saltville, Virginia, prepared by HARZA Engineering Company, 10/76. P. 100001-100075. A transmittal letter to Mr. A.A. Stein, Olin Corporation, from Mr. D.E. Kleiner, HARZA Engineering Company, dated November 22, 1976, is attached.
- ++ 2. Report: Geohydrologic Study, Former Chlor-Alkali Plant Site, Saltville. Virginia, prepared by Olin Corporation, 9/82. P. 100461-100503. A transmittal letter is attached.
- ++ 3. Report: 1984 Supplement to Geohydrologic Study, Former Chlor-Alkali Plant Site, Saltville, Virginia, September 1982, 1984. P. 300001-300016.

* Administrative Record File available 12/12/90 updated 1/18/95 and 11/24/95.

++ These documents can be found in the Administrative Record File for Saltville Waste Disposal Area OU1.

II. REMEDIAL ENFORCEMENT PLANNING

1. Consent Decree between the United States of America and Olin Corporation, 9/15/88. P. 200001-209050.
2. Letter to U.S. EPA Region III, from Mr. Robert L. Collings, Morgan, Lewis & Bockius, re: Notification by the Olin Corporation of a dispute and invocation of dispute resolution concerning the Proposed Remedial Action Plan and the Feasibility Study, 1/27/95. P.
3. Letter to Ms. Gwen E. Pospisil, U.S. EPA from Mr. Robert L. Collings, Morgan, Lewis & Bockius, re: Request for a 60 day extension of the public comment period concerning the Proposed Plan, 2/2/95. P.
4. Letter to Mr. Robert L. Collings, Morgan Lewis & Bockius, from Mr. Russell Fish, U.S. EPA re: Notification that EPA will extend the deadline for the public comment period concerning the Proposed Plan by 31 days to March 20, 1995, 2/10/95. P.
5. Letter to Mr. Robert L. Collings, Morgan Lewis & Bockius, from Ms. Gwen E. Pospisil, U.S. EPA, re: EPA's acceptance of Olin Corporation's request to defer dispute resolution until the end of the public comment period for the Proposed Plan, 2/13/95. P.
6. Letter to Mr. Keith D. Roberts, Olin Chemicals, from Mr. Russell H. Fish, U.S. EPA, re: Transmittal of a copy of the meeting summary report from the February 21, 1995, meeting between EPA and Olin Chemicals, 3/1/95. P. The meeting summary dated February 24, 1995, is attached.

7. Memorandum to file from Ms. Jan Nation and Ms. Gwen E. Pospisil, U.S. EPA, re: Summary of a meeting on March 2, 1995, between Olin Corporation and U.S. EPA, concerning technical issues related to the Proposed Plan, 9/25/95. P.
8. Letter to Mr. Robert L. Collings, Morgan Lewis & Bockius, from Ms. Gwen E. Pospisil, U.S. EPA, re: Proposal to defer the dispute resolution process, 3/23/95. P.
9. Letter to Ms. Gwen E. Pospisil, U.S. EPA, from Mr. Robert L. Collings, Morgan, Lewis & Bockius, re: Olin Corporation's proposal for deferral of the dispute resolution process, 4/4/95. P.
10. Letter to Mr. Robert L. Collings, Morgan, Lewis & Bockius, from Ms. Gwen E. Pospisil, U.S. EPA, re: Notification that EPA will not agree to certain conditions proposed in Mr. Collings' letter of April 4, 1995, concerning deferral of dispute resolution, (see entry 9, Section II), 4/10/95. P.
11. Notes from a meeting between U.S. EPA and Counsel for Olin Corporation, re: The Proposed Plan and a proposal to defer the dispute resolution process, 4/17/95. P.
12. Letter to Ms. Gwen E. Pospisil, U.S. EPA, from Mr. Robert L. Collings, Morgan, Lewis & Bockius, re: Confirmation of a verbal agreement between Olin Corporation and EPA to defer the dispute resolution process, 5/30/95. P.
13. Letter to Mr. Robert L. Collings, Morgan, Lewis & Bockius, from Ms. Gwen E. Pospisil, U.S. EPA, re: Transmittal of the signed letter agreement to postpone the dispute resolution, 5/31/95. P. The signed letter agreement dated May 30, 1995, is attached.
14. Letter to Ms. Gwen Pospisil, U.S. EPA, from Ms. Sara Alyea Anderson, Morgan, Lewis & Bockius, re: Summary of a telephone conference call concerning the status of the selection of a remedy for the site and the possibility of a meeting to further clarify these issues, 8/28/95. P.
15. Letter to Mr. Keith D. Roberts, Olin Chemicals, from Mr. Russell H. Fish, U.S. EPA, re: Transmittal of the summary report for the August 25, 1995, conference call between EPA and Olin, 9/25/95. P. The summary report dated September 22, 1995, is attached.

III. REMEDIAL RESPONSE PLANNING

- * 1. Report: Saltville RI/FS Final Work Plan, prepared by CH2M-Hill, 3/89. P. 300001-3000052.
2. Report: Work Plan, Remedial Investigation/ Feasibility Study. Operable Unit #2. Groundwater and Source Area Studies, Saltville Waste Disposal Site, Saltville, Virginia, prepared by Olin Chemicals Group, 6/89. P. 300053-300430.

3. Letter to Mr. Verrill Norwood, Olin Chemicals, from Mr. Paul Leonard and Ms. Lesley Brunner, U.S. EPA, re: Approval of RI/FS, 9/22/89. P. 300431-300431.
4. Report: Saltville Subcontract Documents for Laboratory Services, prepared by CH2M-Hill Southeast Inc., 10/17/89. P. 300432-800557.
5. Letter to Mr. Verrill Norwood, Olin Chemicals, from Mr. Paul Leonard, U.S. EPA, re: Issuance of conditional approval of Operable Unit #2 and #3 Sampling and Analytic Plan, 1/18/90. P. 300888-300624. The plan for OU2 is attached.
6. Report: Alternative Remedial Contracting Strategy; Program Sampling and Analysis Plan, Saltville RI/FS Oversight, prepared by CH2M-Hill, 4/90. P. 300625-300826.
7. Memorandum to Mr. Steve Druschel, CH2M-Hill, from Mr. Russell Fish, U.S. EPA, re: Continued concerns involving the groundwater flux calculations for the Former Chlorine Plant Site, 3/31/94. P. 300827-300827.
8. Memorandum to Mr. Brian Marshall, CH2M-Hill, from Mr. Russell Fish, U.S. EPA, re: Follow up on technical issues concerning mercury loading to the North Fork of the Holston River from the Former Chlorine Plant Site, 6/9/94. P. 300828-300828.
9. Memorandum to Mr. Russell Fish, U.S. EPA, from Mr. Brian Marshall, CH2M-Hill, re: Review of the cost estimate and assumptions for the retort treatment of mercury-laden material at the Former Chlorine Plant Site, 9/23/94. P. 300829-300835.

* Table 4-1, Micro Workplan Spreadsheet, of this report has been placed in the Confidential Business Information section of the file located at EPA Region III Headquarters, Philadelphia, PA.

10. Memorandum to Mr. Russell Fish, U.S. EPA, from Mr. Brian Marshall, CH2M-Hill, re: Evaluation and cost comparison of the proposed cap alternatives for Ponds 5 and 6, 10/24/94. P. 300836-300839.
11. Memorandum to Mr. Russell Fish, U.S. EPA, from Mr. Brian Marshall, CH2M-Hill, re: Evaluation and cost comparison of the proposed multilayer cap in Alternative P6D and a RCRA cap, 10/28/94. P. 300840-300842.
12. Report: Human Health Risk Assessment, prepared by ABB Environmental Services, Inc., 11/94. P. 300843-301265.
13. Memorandum to Risk-Based Concentration Table mailing list from Mr. Roy L. Smith, U.S. EPA, re: Fourth quarter Risk-Based Concentration Table, 11/8/94. P. 301266-301286.
14. Report: Remedial Investigation Report Executive Summary, Volume I, prepared by Golder Associates, 12/94. P. 301287-301371.
15. Report: Remedial Investigation Report, Volume 2, prepared by Golder Associates, 12/94. P. 301372-301680.

16. Report: Remedial Investigation Report, Volume 3, prepared by Golder Associates, 12/94. P. 301681-302178.
17. Report: Remedial Investigation Report, Volume 4, prepared by Golder Associates, 12/94. P. 302179-302656.
18. Report: Remedial Investigation Report, Volume 5, prepared by Golder Associates, 12/94. P. 302657-303214.
19. Report: Remedial Investigation Report, Volume 6, prepared by Golder Associates, 12/94. P. 303215-304020.
20. Memorandum to Mr. Russell Fish, U.S. EPA, from Mr. Brian Marshall, CH2M-Hill, re: Transmittal of two documents pertaining to estimates of mercury loading to the North Fork of the Holston River (NFHR) from the Former Chlorine Plant Site (FCPS), 1/4/95. P. 304021-304058. A response package entitled Mercury Loading to the NFHR at the FCPS dated April 11, 1994, and a memorandum regarding recalculation of the mass loading of mercury to the NFHR dated July 5, 1994 are attached.
21. Report: Feasibility Study, Volume 1, prepared by Olin Corporation, 1/95. P. 304059-304515A.
22. Report: Feasibility Study, Volume 2, prepared by Olin Corporation, 1/95. P. 304516-304933.
23. Proposed Remedial Action Plan, Saltville Waste Disposal Ponds, 1/95. P. 304934-304964.
24. Report: Geographic Distribution of Mercury in Asiatic Clams, Corbicula Fluminea. From the North Fork Holston River. Virginia, prepared by U.S. Fish and Wildlife Service, 1/93. P.
25. Letter to Mr. Russell H. Fish, U.S. EPA, from Mr. Jeffrey T. Howard, Virginia Department of Environmental Quality (VDEQ), re: Comments concerning the risk assessment for Operable Unit 3 (OU3) and Operable Unit 4 (OU4) at the site, 5/5/93. P.
26. Letter to Mr. Keith D. Roberts, Olin Chemicals, from Mr. Russell H. Fish, U.S. EPA, re: Transmittal of the Saltville Site Review and Update, prepared by the Agency for Toxic Substances and Disease Registry (ATSDR), 5/17/93. P. The Site Review and Update, dated September 9, 1992, is attached.
27. Letter to Mr. Russell H. Fish, U.S. EPA, from Mr. Keith D. Roberts, Olin Chemicals, re: Comments concerning the ATSDR Site Review and Update, 6/21/93. P. A list of Olin's comments and a memorandum, dated June 17, 1993, providing the comments of ABB Environmental Services, Inc. concerning the ATSDR Site Review and Update are attached.
28. Letter to Mr. Jeffrey T. Howard, VDEQ, from Mr. Russell H. Fish, U.S. EPA, re: Request for comments concerning the draft Feasibility Study for Operable Unit 2 (OU2) and identification of State applicable or relevant and appropriate requirements (ARARs), 6/22/93. P.

29. Letter to Mr. Russell H. Fish, from Mr. Paul Spaulding, VDEQ, re: VDEQ's intention to respond to EPA's request for potential ARARs during the ongoing review of the OU2 Feasibility Study, 7/20/93. P.
30. Letter to Mr. Russell H. Fish, U.S. EPA, from Mr. Jeffrey T. Howard, VDEQ, re: Comments concerning the revised Remedial Investigation Report for OU2, 7/28/93. P. A list of VDEQ's comments is attached
31. Letter to Mr. Russell H. Fish, U.S. EPA, from Mr. Don Henne, U.S. Department of the Interior (DOI), re: A status report on the preparation of the EPA-requested Preliminary Natural Resources Survey (PNRS) for the site, 10/29/93. P.
32. Letter to Mr. Thomas C. Voltaggio, U.S. EPA, from Mr. Jonathan P. Deason, U.S. DOI, re: Preparation of a PNRS, 11/10/93. P. A report entitled Technical Analysis of the Saltville Waste Disposal Site, prepared by U.S. DOI, is attached.

Letter to Mr. Russell H. Fish, U.S. EPA, from Mr. Jeffrey T. Howard, VDEQ, re: Comments concerning the draft Feasibility Study for OU2, 3/22/94. A list of VDEQ's comments is attached.
34. Facsimile transmittal to Mr. Russell H. Fish, U.S. EPA, from Mr. Paul Spaulding, VDEQ, re: Notification of Potential Virginia ARARs for OU2 of the Saltville Site, 11/14/94. P.
35. Letter to Mr. Thomas C. Voltaggio, U.S. EPA, from Mr. Don Henne, U.S. DOI, re: Comments on the draft Proposed Remedial Action Plan, 11/25/94. P.
36. Letter to Mr. Keith D. Roberts, Olin Chemicals, from Mr. Russell H. Fish, U.S. EPA, re: Notification of EPA's approval of the Feasibility Study, 3/23/95. P.
37. Record of Decision, Saltville Waste Disposal Ponds Superfund Site, Operable Unit 2 (Pond 5 and Pond 6), 9/29/95. P.

V. COMMUNITY INVOLVEMENT/CONGRESSIONAL CORRESPONDENCE/IMAGERY

1. U.S. EPA Fact Sheet, re: Site status, Saltville Waste Disposal Superfund Site, Smyth County, Virginia, 7/93. P.
2. Report: Community Relations Plan for the Saltville Waste Disposal Superfund Site, prepared by Dynamac Corporation, 1/10/94. P.
3. U.S. EPA Community Update, re: Site status, Saltville Waste Disposal Ponds Superfund Site, Smyth County, Virginia, 7/94. P.
4. Press Release from U.S. EPA Environmental News entitled "U.S. EPA and VDEQ Representatives Available to Answer Citizen Questions or Concerns About Saltville, Virginia Waste Disposal Superfund Site," 7/19/94. P.
5. U.S. EPA Public Notice, Saltville Waste Disposal Site,

re: EPA seeks public comments on the Proposed Remedial Action Plan and announces public meeting Saltville News-Messenger, 1/4/95. P.

6. Press Release from U.S. EPA Environmental News entitled "EPA Schedules Public Hearing for Saltville Superfund Cleanup," 1/18/95. P.
7. Newspaper article entitled "\$57 Million Cost for Saltville Site," Roanoke Time and World News, 1/21/95. P.
8. Olin Chlor-Alkali Products Memorandum to Concerned Citizens of Saltville and Surrounding Communities, re: Comments concerning EPA's proposed plan for OU2 of the Saltville Waste Disposal Site, 1/27/95. P.
9. Letter to Mr. Russell Fish, U.S. SPA, from Ms. Nila Webb, re: Comments on EPA's proposal to continue remediation activities at the Former Chlorine Plant Site, 1/31/95. P.
10. U.S. EPA Community Update, re: Site status, Saltville Waste Disposal Site, 2/95. P.
11. U.S. EPA Flyer, Saltville Waste Disposal/Site, re: Notice of public meeting on February 1, 1995, on the Proposed Plan for OU2 cleanup. P.
12. Transcript of U.S. SPA OU2 proposed plan Public meeting, Saltville Waste Disposal Site, 2/1/95. P.
13. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Charles C. Norris, re: Comments on the Proposed Plan for OU2, 2/1/95. P.
14. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Edward T. Asbury, re: Comments on EPA's Proposed Plan, 2/1/95. P.
15. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Carl Slate, re: Comments on EPA's Proposed Plan, 2/2/95. P.
16. Letter to Mr. Russell Fish, U.S. EPA, from Mr. C.W. Barbrow, Jr., re: Comments on EPA's Proposed Plan, 2/2/95. P.
17. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Owen Cox, Smythe County Board of Supervisors, re: Comments on EPA's Proposed Plan, 2/2/95. P.
18. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Madison E. Marye, Commonwealth of Virginia Senate, re: Comments on EPA's Proposed Plan, 2/3/95. P.
19. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Leroy Marshall, re: Comments on EPA's Proposed Plan, 2/10/95. P.
20. Letter to Mr. Pat Gaughn, U.S. EPA, from Mr. Richard Raione, re: Comments on the Remedial Investigation/ Feasibility Study Report (RI/FS) and EPA's Proposed Plan, 2/10/95. P.

21. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Richard Raione, re: Comments on the RI/FS and EPA's Proposed Plan, 2/10/95. P.
22. Letter to Mr. Russell Fish, U.S. EPA, from Mr. William C. McAllister, Comments on EPA's Proposed Plan, 2/13/95. P. A newspaper editorial from the Saltville News Messenger entitled "EPA Urged to Take a Second Look" is attached.
23. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Robert R. Spurling III, re: Comments on the Proposed Plan, 2/13/95. P.
24. Petitions in opposition to EPA's plans to remediate the Saltville site and in support of Olin's alternatives to EPA's plans, 2/13/95. P.
25. Petitions in opposition to EPA's plans to remediate the Saltville site and in support of Olin's alternatives to EPA's plans, 2/14/95. P.
26. Letter to Mr. Russell Fish, U.S. EPA, from Ms. Florence C. Jackson, 2/14/95. P.
27. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Frank E. Lewis, Mayor, and Council, Town of Saltville, re: Comments on the Proposed Plan, 2/14/95. P.
28. U.S. EPA Public Notice, Saltville Waste Disposal Site, re: EPA extends the public comment period for the Proposed Plan until March 20, 1995, Smyth County News, 2/15/95. P.
29. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Harry S. Dunham, re: Comments on EPA's Proposed Plan, 2/15/95. P.
30. Letter to Mr. Russell Fish, U.S. EPA, from L.D. Allison, re: Comments on EPA's Proposed Plan, 2/15/95. P.
31. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Stanley M. Cabill, re: Comments on EPA's Proposed Plan, 2/15/95. P. Two photographs of the town are attached.
32. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Barnes L. Kidd, Virginia House of Delegates, re: Comments on EPA's Proposed Plan, 2/16/95. P.
33. Letter to Mr. Madison E. Marye, Commonwealth of Virginia Senate, from Mr. Russell H. Fish, U.S. EPA, re: A reply to the Senator's February 3, 1995 letter concerning the site, 2/16/95. P.
34. U.S. EPA Public Notice, Saltville Waste Disposal Site, re: EPA extends the public comment period for the Proposed Plan until March 20, 1995, The Saltville News-Messenger, 2/17/95. P.
35. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Robert L. Elmore, re: Comments on EPA's Proposed Plan, 2/17/95. P.
36. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Henry C.

Everhart, re: Comments on EPA's Proposed Plan,
2/17/95. P.

37. Letter to Mr. Russell Fish, U.S. EPA, from C.R. Jones, Jr., re: Comments on EPA's Proposed Plan, 2/20/95. P.
38. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Frank E. Lewis, Mayor, Town of Saltville, re: Comments on EPA's Proposed Plan, 2/20/95. P.
39. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Fred M. Dye, Jr., et al., re: Request for 120 day extension of the comment period, 2/23/95. P.
40. Letter to Ms. Ellen Stein from Mr. Patrick Gaughan, U.S. EPA, re: Transmittal of the public meeting transcript and an update of recent activities surrounding the Proposed Plan, 2/24/95. P.
41. Press Release from Olin Corporation entitled "Olin's Saltville Superfund Site Clean-up Plan Provides Long-Term Protection with Minimal Impact on Community," 2/22/95. P.
42. Letter to Mr. Peter H. Kostmayer, U.S. EPA, from Ms. Becky Norton Dunlop, Secretary of Natural Resources, Commonwealth of Virginia, re: Comments concerning EPA's Proposed Plan, 2/27/95. P.
43. Press Release from U.S. EPA Environmental News entitled "EPA Extends Invitation to Citizens for Informal Talks on Saltville Clean-up," 2/28/95. P.
44. Letter to Mr. Russell Fish, U.S. EPA, from Mr. Ed Val, TSI Environmental, re: Follow-up letter to telephone conversation concerning Former Chlorine Plant Site, 3/3/95. P.
45. Letter to Mr. Peter H. Kostmayer, U.S. EPA, from Mr. Charles S. Robb and Mr. John Warner, United States Senate, re: Comments on the Proposed Remedial Action Plan, 3/6/95. P.
46. Letter to Mr. Stanley M. Cahill, from Mr. Russell H. Fish, U.S. EPA, re: A response to. Mr. Cahill's February 15, 1995, letter concerning the site, 3/6/95. P.
47. Letter to Mr. Russell H. Fish, U.S. EPA, from Mr. Robert O. Cahill, re: Comments on EPA's Proposed Plan, 3/8/95. P.
48. Letter to Mr. Abraham Ferdas, U.S. EPA, from Mr. Peter W. Schmidt, Director, Department of Environmental Quality, Commonwealth of Virginia, re: Transmittal of comments concerning technical review of the Proposed Remedial Action Plan, 3/8/95. P. The comments are attached.
49. Newspaper articles entitled "Citizens Petition EPA" and "EPA Sessions Rescheduled," The Saltville News-Messenger, 3/10/95. P.
50. Newspaper article entitled "EPA Sessions Rescheduled," "Smyth County News, 3/11/95. P.

51. Newspaper article entitled "Saltville Petition Supports EPA's Cleanup Proposal," Smyth County News, 3/11/95. P.
52. Newspaper article entitled "State Backs Olin in EPA Dispute Over Site Cleanup," Richmond Times-Dispatch, 3/11/95. P.
53. Letter to Mr. Russell H. Fish, U.S. EPA, from Ms. Jane Knox, re: Comments on the Proposed Remedial Action Plan, 3/14/95. P.
54. Letter to Mr. Russell H. Fish, U.S. EPA, from Mr. Troy T. DuGuay, International Environmental Trading Company, re: Comments on the Proposed Remedial Action Plan, 3/15/95. P.
55. Newspaper article entitled "EPA Says Olin May be Monitored 'Forever'," Bristol Herald-Courier, 3/16/95. P.
56. Letter to Mr. Thomas C. Voltaggio, U.S. EPA, from Mr. Don Henne, U.S. Department of the Interior, re: Comments on the Proposed Remedial Action Plan, 3/16/95. P.
57. Letter to Mr. Russell H. Fish, U.S. EPA, from Dale Surber, re: Comments on the Proposed Remedial Action Plan, 3/16/95. P.
58. Newspaper article entitled "EPA Sells Cleanup Plan to Skeptical Saltville," Roanoke Times and World-News, 3/17/95. P.
59. Letter to Mr. Russell H. Fish, U.S. EPA, from Mr. & Ms. Kenneth E. Ray, re: Comments on the Proposed Remedial Action Plan, 3/17/95. P.
60. Newspaper article entitled "EPA Discusses Cleanup Plan with Saltville Citizens," Smyth County News, 3/18/95. P.
61. Report: Comments on EPA's Proposed Remedial Action Plan. Operable Unit Two, prepared by Olin Corporation, 3/20/95. P. A cover letter to Mr. Thomas C. Voltaggio, U.S. EPA, from Mr. Robert L. Collings, Morgan, Lewis & Bockius, dated March 20, 1995, concerning Olin Corporation's position on EPA's Proposed Remedial Action Plan and a transmittal letter to Mr. Russell H. Fish, U.S. EPA, from Mr. Keith D. Roberts, Olin Corporation, dated March 20, 1995, are attached.
62. Letter to Mr. Thomas C. Voltaggio, U.S. EPA, from Ms. Sara Alyea Anderson, Morgan, Lewis & Bockius, re: Transmittal of Table A-2 to Olin Corporation's comments on the Proposed Plan which was not transmitted along with the rest of the comments, 3/20/95. P. The table is attached.
63. Newspaper article entitled "Don't Go Down to the Basement," The Saltville News Messenger, 3/24/95. P.
64. Newspaper article entitled "Mercury Moonshine," The Saltville News Messenger, 3/24/95. P.
65. Letter to Honorable Becky Norton Dunlop, Secretary of Natural Resources, Commonwealth of Virginia, from Mr.

Peter H. Kostmayer, U.S. EPA, re: A response to the Secretary's February 27, 1995, letter concerning the site and an update on recent activities concerning the Proposed Plan, 3/27/95. P.

66. Letter to Mr. Dickie Dye from Mr. Russell H. Fish, U.S. EPA, re: Response to questions relating to the Operable Unit 2 Proposed Plan and the site, 4/13/95. P. A copy of Mr. Dye's letter (undated) containing the questions is attached.
67. Letter to Mr. Russell H. Fish, U.S. EPA, from Mr. Stanley M. (Rusty) Cahill, re: Follow up to May 2, 1995, telephone conversation and questions concerning the site, 5/15/95. P. The following are attached:
 - a) Reference List;
 - b) Questions;
 - c) Photographs of the area surrounding the site;
 - d) ATSDR Public Health Statement concerning Mercury, dated December 1989.
68. Letter to Mr. Stanley M. Cahill, from Mr. Russell H. Fish, U.S. EPA, re: Status of EPA's response to Mr. Cahill's questions, 6/9/95. P.
69. Letter to Mr. Stanley M. Cahill, from Mr. Russell H. Fish, U.S. EPA, re: Response to correspondence and photographs of May 15, 1995, concerning remedies at the site, 6/22/95. P. Questions/responses about concerns at the site and a reference concentration for chronic inhalation exposure - Mercury, elemental are attached.
70. Letter to Mr. Barnes L. Kidd, Commonwealth of Virginia House of Delegates, from Mr. Peter H. Kostmayer, U.S. EPA, re: A response to Mr. Kidd's February 3, 1995 letter concerning the site, (undated).
71. Letter to Mr. Russell H. Fish, U.S. EPA, from Danny and Sherry Neal, re: Support of EPA's efforts at the site, (undated). P.
72. Letter to Mr. Russell H. Fish, U.S. EPA, from Henry and Bessie Neal, re: Support of EPA's efforts at the site, (undated). P.
73. Letter to Mr. Russell H. Fish, U.S. EPA, from Rick and Charlene McCoy, re: Support of EPA's efforts at the site, (undated). P.
74. Letter to Mr. Russell H. Fish, U.S. EPA, from Robert L. (Joe) and Darlene Nutter, re: Support of EPA's efforts at the site, (undated). P.
75. Letter to Mr. Russell H. Fish, U.S. EPA, from Mr. Wm. Reece Smith, Sr., re: Support of EPA's efforts at the site, (undated). P.
76. Letter to Mr. Russell H. Fish, U.S. EPA, from Sonny and Dottie Neal, re: Comments on EPA's proposed

alternatives for cleanup of the site, (dated). P. An envelope is attached.

77. Letter to Mr. Russell H. Fish, U.S. EPA, from Bobby and Doris Poore, re: Comments on EPA's proposed alternatives for cleanup of the site, (undated). P. An envelope is attached.
78. Letter to Mr. Russell H. Fish, U.S. EPA, from Carlton and Frankie Swartz, re: Support of EPA's efforts at the site, (undated). P. An envelope is attached.
79. Letter to Mr. Russell H. Fish, U.S. EPA, from Vernon and Pearl Smith, re: Support of EPA's efforts at the site, (undated). P. An envelope is attached.
80. Letter to Mr. Russell H. Fish, U.S. EPA, from Ms. Lisa Null, re: Support of EPA's efforts at the site, (undated). P.
81. Letter to Mr. Russell H. Fish, U.S. EPA, from Ms. Diana Dye, re: Support of EPA's efforts at the site, (undated). p.
82. U.S. EPA Public Notice, Saltville Waste Disposal Site, re: Announcement of the Record of Decision for the site, Bristol Herald Courier/Virginia-Tennessean, 10/4/95. P.

SITE SPECIFIC GUIDANCE DOCUMENTS

1. U.S. EPA Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments, prepared by the U.S. EPA Office of Solid Waste and Emergency Response, 7/89.
EPA/530-SW-89-047
2. U.S. EPA Technology Fact Sheet, A Citizen's Guide to Thermal Desorption, prepared by the U.S. EPA Office of Solid Waste and Emergency Response, 3/92
EPA/542/F-92/006
3. Excerpts from Abstract Proceedings of a U.S. EPA Workshop on Removal, Recovery, Treatment and Disposal of Arsenic and Mercury, 8/92.
EPA/600/R-92/105
4. Toxicological Profile for Mercury, prepared by Clement International Corporation for the U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, 10/92.
5. U.S. EPA Engineering Bulletin, Thermal-Desorption Treatment, prepared by the U.S. EPA Office of Emergency and Remedial Response, 2/94.
EPA/540/S-94-501

INDEX FOR THE U.S. EPA COMPENDIUM OF CERCLA RESPONSE SELECTION GUIDANCE DOCUMENTS AND CERTAIN DOCUMENTS FROM THE COMPENDIUM

1. Index for the U.S. EPA Compendium of CERCLA Response

Selection Guidance Documents, 3/28/91.

2. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, prepared by Office of Solid Waste and Emergency Response (OSWER)/Office of Emergency and Remedial Response (OERR), 10/1/88.
OSWER Directive 9355.3-01
EPA/540/G-89/004
Compendium Document No. 2002*
3. CERCLA Compliance with Other Laws Manual (Draft), prepared by OERR, 8/8/88.
OSWER Directive 9234.1-01
EPA/540/G-89/006
Compendium document No. 3002*
4. CERCLA Compliance With Other Laws Manual, Part II: Clean Air Act and Other Environmental Statutes and State Requirements, prepared by OERR, 8/1/89.
OSWER Directive 9234.1-02
EPA/540/G-89/009
Compendium Document No. 3013*
5. RCRA ARARs: Focus on Closure Requirements [Quick Reference Fact Sheet], prepared by OSWER, 10/1/89.
OSWER Directive 9234.2-04FS
Compendium Document No. 3017*
6. The Feasibility Study - Development and Screening of Remedial Action Alternatives [Quick Reference Fact Sheet], prepared by OSWER, 11/1/89.
OSWER Directive 9355.3-01FS3
Compendium Document No. 2018*
- * These documents are available for review at the U.S. EPA Docket Room, Region III, 841 Chestnut St., 9th Floor, Philadelphia, Pennsylvania.

APPENDIX B

GLOSSARY

Administrative Record - EPA's official compilation of documents, data, reports, and other information supporting selection of a response action. The record is placed in the information repository to allow public access to the material.

Background - The average concentration of a contaminant in the Site area either naturally occurring or from external sources unrelated from the Site.

CERCLA - See SUPERFUND below.

Groundwater - Water found beneath the earth's surface that fills pores between soil, sand, and gravel particles to the point of saturation. Ground water often flows more slowly than surface water. When it occurs in sufficient quantity, ground water can be used as a water supply.

Hazard Index (HI) - The HI is the measurement expressing the overall potential for noncarcinogenic effects posed by contaminants. An HI greater than 1 is characterized as presenting an unacceptable noncarcinogenic risk

Information Repository - A location where documents and data related to the Superfund project are placed by EPA to allow access to the material by the public.

MCL - The Maximum Contaminant Level or MCL is the maximum permissible level of a contaminant in water which is delivered to any user of a public water system.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP) - The federal regulation that guides determination of the sites to be corrected under the Superfund program and the program to prevent or control spills into surface waters or other portions of the environment.

National Priorities List (NPL) - EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund. A site must be on the NPL to receive money from the Trust Fund for remedial action. The list is based primarily on the score a site receives from the Hazard Ranking System. EPA is required to update the NPL at least once a year.

Record of Decision (ROD) - A public document that explains which cleanup alternative(s) will be used at National Priorities List sites.

Remedial Investigation and Feasibility Study (RI/FS) - An in-depth study designed to gather the data necessary to determine the nature and extent of contamination at a Superfund site; establish criteria for cleaning up the site; identify preliminary alternatives for remedial actions; and support the technical and cost analyses of the alternatives. The remedial investigation is usually done with the feasibility study. Together they are usually referred to as the "RI/FS".

Resource Conservation and Recovery Act (RCRA) - A federal law that established a regulatory system to track hazardous substances from the time of generation to disposal. The law requires safe and secure procedures to be used in treating, transporting, storing, and disposing of hazardous substances.

Risk Assessment (RA) - The qualitative and quantitative evaluation performed in an effort to define the risk posed to human health and/or the environment by the presence or potential presence and/or use of specific pollutants.

Scientific Notation - In dealing with particularly large or small numbers, scientists and engineers have developed a "short hand" means of expressing numerical values. For example: 1,000,000 can be written as 1×10^6 and 1/1,000,000 can be written as 1×10^{-6} .

SUPERFUND (Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)) - The program operated under the legislative authority of CERCLA and Superfund Amendments and Reauthorization Act (SARA) that funds and carries out the EPA solid waste emergency removal and long-term remedial activities. These activities include establishing the National Priorities List, investigating sites for inclusion on the list, determining their priority level on the list, and conducting and/or supervising the ultimately determined cleanup and other remedial activities.

Surface Water - All water naturally open to the atmosphere (rivers, lakes, reservoirs, streams, impoundments, seas, estuaries, etc.) and all spring wells, or other collectors which are directly influenced by surface water.